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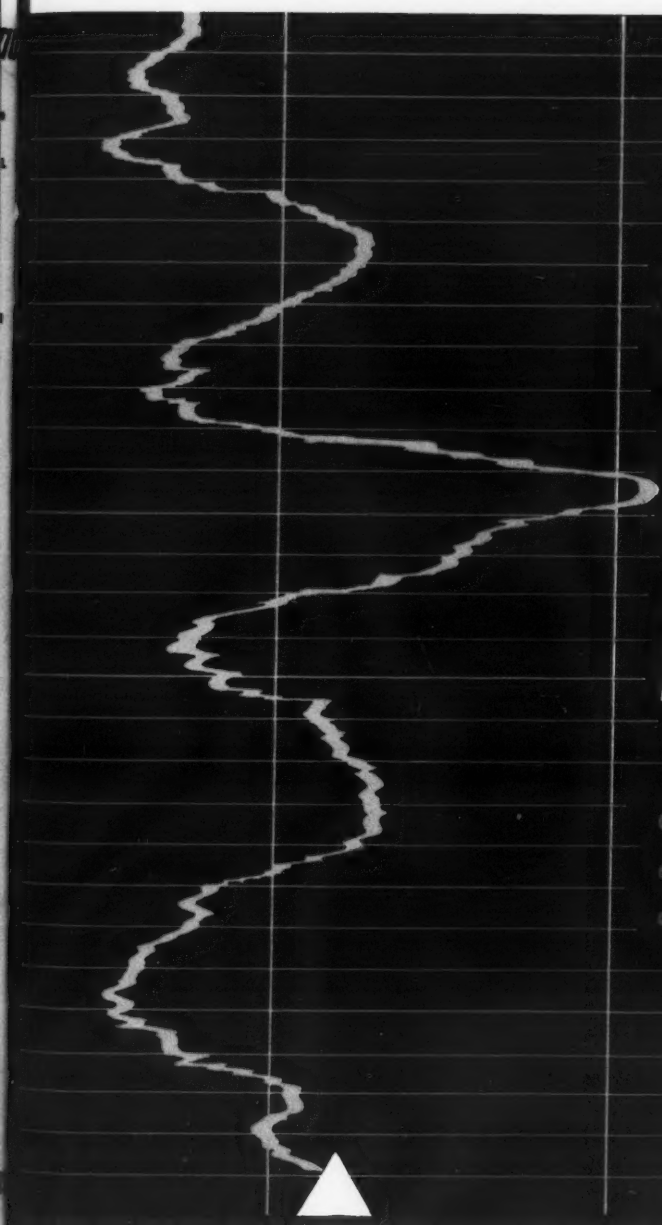
SEPTEMBER 1961

Oxygen Output Could Triple by '70

Chemical industry may unseat steel as No. 1 user as new applications loom 25

Don't Let UV Dim Product Future

Things are happening to help polymers break the UV-sensitive barrier, tap building market 32

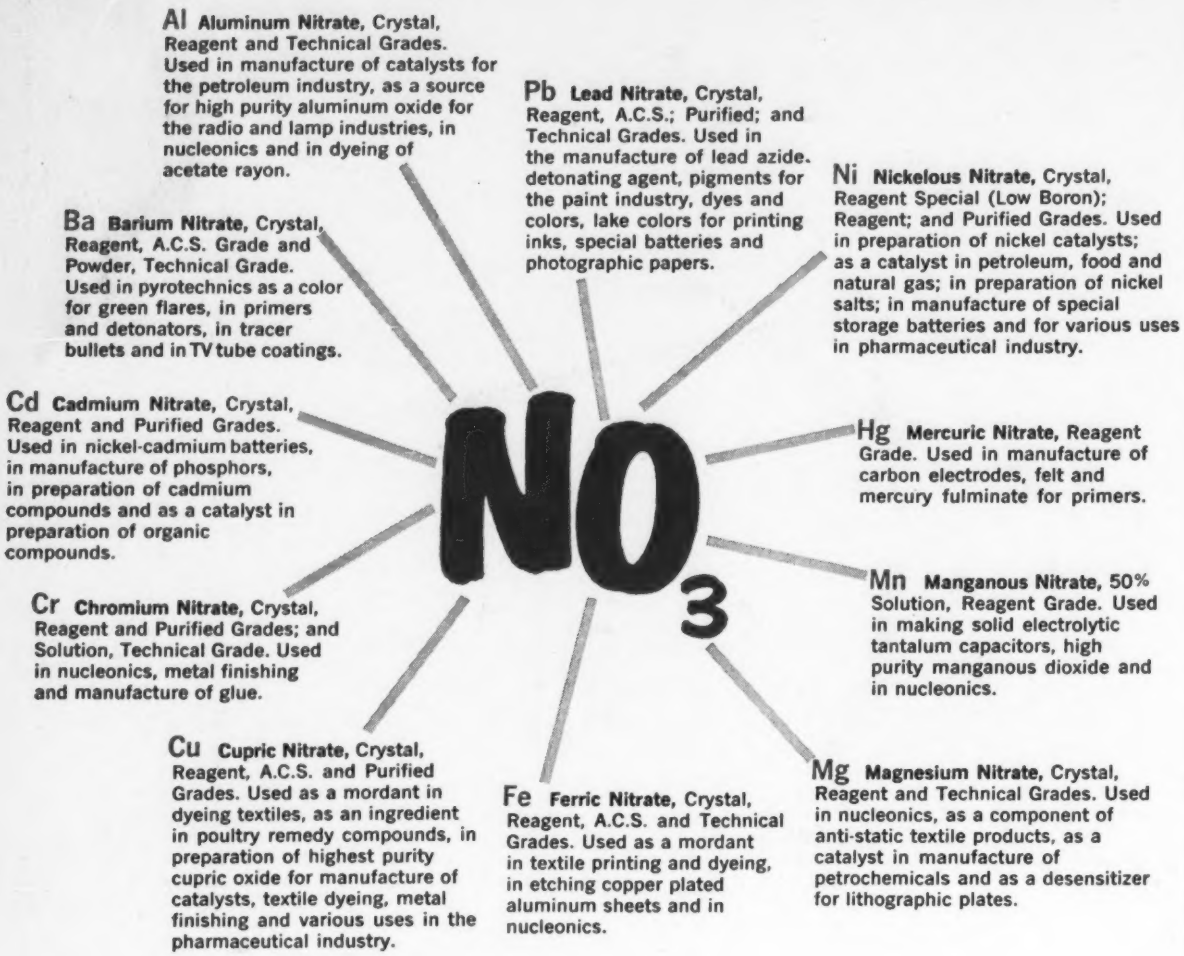


7TH ANNUAL FEATURE—

PROCESS INSTRUMENTATION AND CONTROL

Cyrogenic-instrumentation tips and mass-flowmeter wrap-up kick-off a 32-page extra-emphasis section . . . page 35

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conventions and exhibits

Sept. 14-17. Drug, Chemical & Allied Trades Asscciation, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

Sept. 19-21. TAPPI and Canadian Pulp Association, 4th International Mechanical Pulping Conference, Edgewater Beach hotel, Chicago.

Sept. 24-27. National Power Conference, American Institute of Electrical Engineers and American Society of Mechanical Engineers, St. Francis hotel, San Francisco, Calif.

Sept. 24-27. American Institute of Chemical Engineers, 45th national meeting, Lake Placid club, Lake Placid, N.J.

Sept. 28-30. Chemical Division, American Society for Quality Control, 5th Annual Chemical Conference, Daniel Boone hotel, Charleston, W.Va.

Oct. 1-5. Electrochemical Society, Statler hotel, Detroit, Mich.

Oct. 4-6. Deinking Conference, Technical Association of the Pulp and Paper Industry, Harris hotel, Kalamazoo, Mich.

Oct. 4-6. National Association of Corrosion Engineers, Western Regional Conference, Benson hotel, Portland, Ore.

Oct. 9-11. Plastics-Paper Conference, TAPPI, French Lick-Sheraton hotel, French Lick, Ind.

Oct. 9-11. National Electronics Conference and Exhibition, International Amphitheatre, Chicago, Ill.

Oct. 15-19. TAPPI Engineering Conference, Shoreham hotel, Washington, D.C.

Oct. 16-19. Chemical Section, National Safety Congress, LaSalle hotel, Chicago, Ill.

. . . Meetings and shows of interest to the chemical industries

Oct. 18-19. Commercial Chemical Development Association, Palmer House, Chicago, Ill.

Oct. 18-20. 23rd Annual National Packaging Forum, Packaging Institute, Biltmore hotel, New York City.

Oct. 19-20. National Conference on Industrial Hydraulics, Sherman hotel, Chicago, Ill.

Oct. 23-27. National Metal Congress and Show, American Society for Metals, Cobo Hall, Detroit, Mich.

Oct. 25-26. Computer Applications Symposium, Armour Research Foundation, Morrison hotel, Chicago, Ill.

Oct. 24-27. National Association of Corrosion Engineers, Conference and Exhibition, Shamrock hotel, Houston, Texas.

Oct. 29-*Nov.* 1. National Agricultural Chemicals Association, annual meeting, Homestead, Hot Springs, Pa.

Oct. 31-*Nov.* 4. Federation of Societies for Paint Technology, 39th annual meeting and 26th Paint Industries Show, Shoreham hotel, Washington, D.C.

Nov. 6-8. Conference, Chemical Engineering Division, The Chemical Institute of Canada, Royal York Hotel, Toronto, Canada.

Nov. 7-10. Packaging Machinery Manufacturers Institute, Exhibition, Cobo Hall, Detroit, Mich.

Nov. 15-17. Eastern Analytical Symposium, Statler Hilton hotel, New York City.

Nov. 27-*Dec.* 1. Southeast Region, National Association of Corrosion Engineers, Key Biscayne hotel, Miami, Fla.

Nov. 27-*Dec.* 1. 28th Exposition of Chemical Industries, Coliseum, New York City.



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CHEMICAL PROCESSING

HIGHLIGHTS

SEPTEMBER 1961

VOLUME 24 • NUMBER 9

THIS MONTH'S COVER

The peak shown on the strip-chart recording on the cover is emblematic of the 1961 peak hit by our regular monthly coverage of process instrumentation and control in this month's extra-emphasis feature. This 32-page section leads off with special reports on two of the hottest topics in the field: cryogenic instrumentation and mass flowmeters. Don't stop there, however; there is much more. It all begins on page 35.

Special This Month

25 U.S. could triple oxygen output by 1970

Chemical industry may replace steel as No. 1 user with new uses budding

29 ACHEMA—20 acres of ideas

On-the-spot report points up innovations among 1400 exhibits at continental 'Chem Show'

32 Don't let UV dim your product future

Here's what's being done to help polymers crack UV-sensitive barrier, tap building market

35 Process Instrumentation and Control

. . . 7th Annual Extra-emphasis Feature

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- Mass flowmeters catch on in the CPI
- Training men for maintenance duty
- Look before you leap into computers
- Kiln interior watched via TV

67 New use avenues open for organophosphites

Modification of transesterification route boosts growing interest in phosphorus

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91 Saves $7000 in repairs to column, 5 weeks' time

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120 Conveyor's reliability offsets inaccessibility

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over the editor's shoulder



Cooperation key to good stream analysis

Successful closed-loop computer-controlled operations depend on many elements. Systems engineering, electronic computation, feasibility studies, economic appraisal and process stream analysis are five that contributed to the success of Monsanto's operations at Luling, Louisiana (see CHEMICAL PROCESSING, December 1960).

Continuous measurement of product quality is one of the important elements on which successful computer control depends. A good stream sample can make the operation extremely successful. On the other hand, poor sampling can mean total failure.

Problems that exist in securing that "perfect sample" are not easy to overcome. In many cases the user is handicapped by not having enough information about the manufacturer's equipment. Furthermore, the manufacturer is handicapped by not having enough data about the user's product.

The problem is still further complicated by the need, in many cases, for "tailor-made" sampling systems. If the manufacturer is not given sufficient data to design an adequate sampling system, the operation obviously will be unsatisfactory. If the user designs the sampling system, he then becomes enmeshed in the problem of matching the system with the analyzer.

It is apparent that more "togetherness" is needed to solve this problem. The upsurge of interest in stream analysis, particularly gas chromatography, will mean that closer cooperation between user and manufacturer is a "must."

The instrument manufacturer needs all the information he can possibly secure regarding product specifications. Likewise the user must have complete information regarding the process stream analyzer.

John C. Vaaler

John C. Vaaler,
Chairman, Editorial Board

"Made OF Stainless Steel ...Made BY Jenkins"

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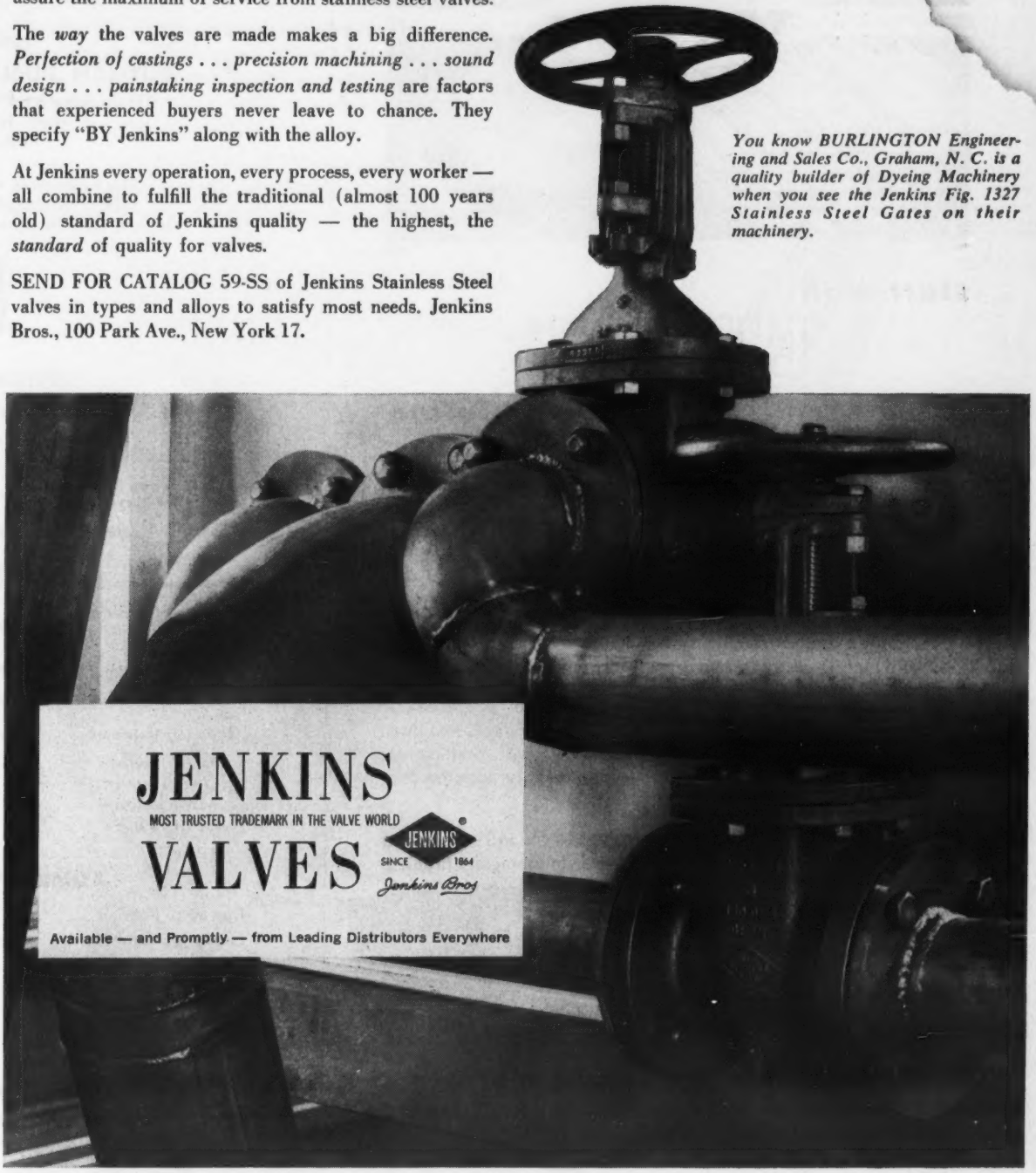
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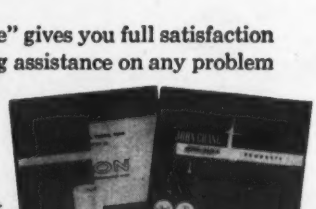
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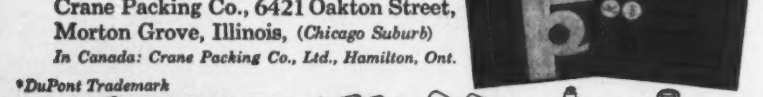
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CHEMICAL PROCESSING.

SEPTEMBER 1961
VOLUME 24 • NUMBER 9

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Accepted as Controlled Circulation publication at Mendota, Illinois, Chicago, Illinois and New York, New York. Publication office: 111 E. Delaware Place, Chicago 11, Illinois. Address all correspondence to Editorial and Executive office, 111 E. Delaware Place, Chicago 11, Illinois.

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Packed Tower Performance Improved with

"GAS-INJECTION" SUPPORT PLATES

The dramatically lower pressure drops expected through the higher bed voidage obtainable with Intalox® Saddles and Pall Rings cannot be realized when the packing support plate restricts gas and liquid flow.

For maximum performance from these newer packings, the support plate must provide an effective free area equal or greater to the free area of the bed (which in some instances may run as high as 95%).

To meet this need, U. S. Stoneware engineers have developed a series of packing support plates based on the principle of injecting the gas into the bed above the point where the liquid disengages. Thus, liquid leaving the column cannot restrict gas flow into the column and the low pressure drops anticipated from Intalox Saddles and Pall Rings can be fully realized.

"Gas-Injection" Support Plates* are made in a variety of types and from a number of materials.

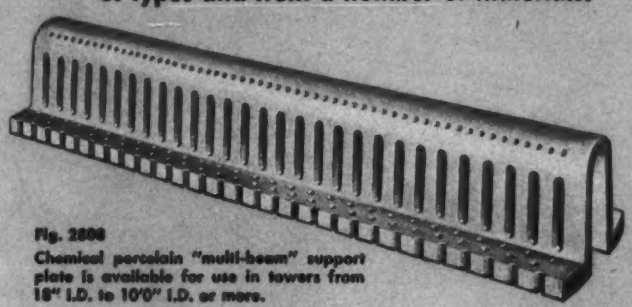


Fig. 2808
Chemical porcelain "multi-beam" support plate is available for use in towers from 18" I.D. to 10'0" I.D. or more.

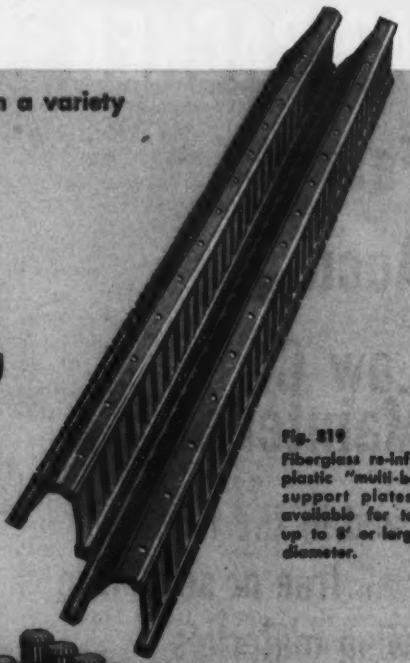


Fig. 819
Fiberglass re-inforced plastic "multi-beam" support plates are available for towers up to 8' or larger in diameter.

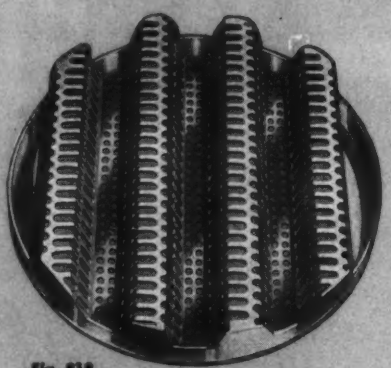
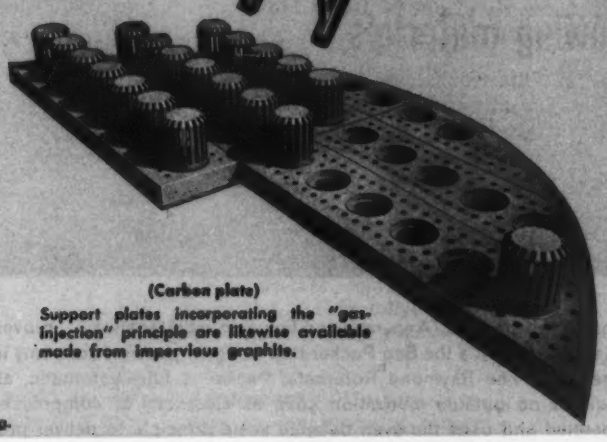


Fig. 818
The "gas-injection" principle is available in any of the weldable alloys or elements in one-piece or two-piece construction for towers 12" through 48" or in multi-beam construction for towers of unlimited size.



(Carbon plate)
Support plates incorporating the "gas-injection" principle are likewise available made from impervious graphite.

*Covered by patents granted or pending.



433-G

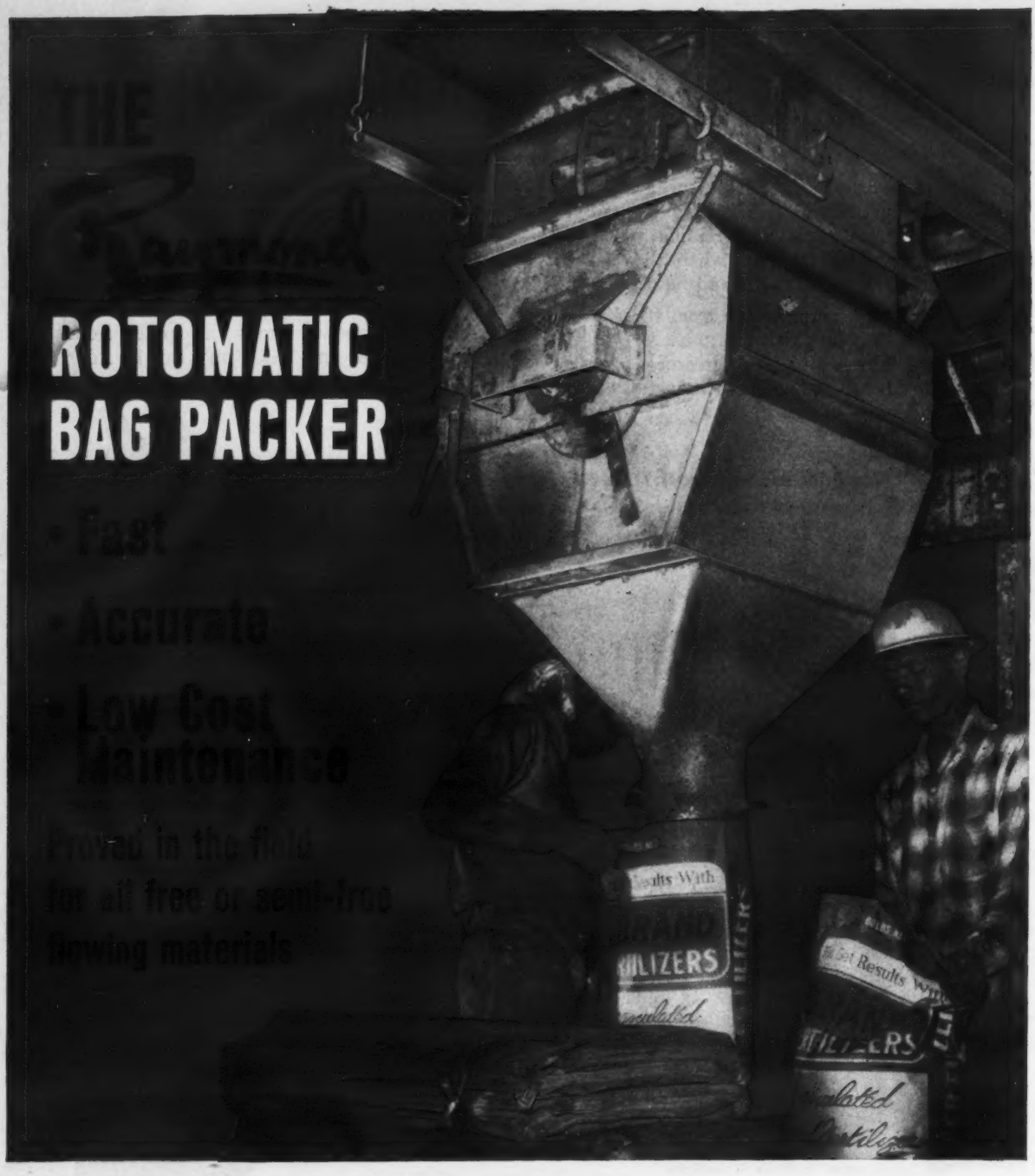
WRITE FOR THIS NEW BULLETIN

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CHEM-TRENDS / Our Growing Industry

Diversification pace stepped up in CPI as 7 firms act

With only the embroglio between **Diamond Alkali Co.** and **Commercial Solvents Corp.** over **Chemical Process Co.** momentarily marring the scene, inter-corporate courtships were being consummated at a pace more appropriate for June than July or August.

Commercial Solvents' bid to thwart the merger of Chemical Process and Diamond Alkali aborted when Commercial Solvents agreed to sell its holdings of Chemical Process stock to Diamond, giving the latter control of more than 80% of the stock of the West Coast company.

ComSol, a substantial holder of Chemical Process stock whose merger offer had been rejected, sought control by offering $15 a share for Chemical Process stock then selling at approximately $12. Diamond matched this offer, later paid $15 a share for ComSol's holdings.

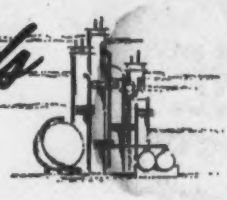
More routinely transacted was the acquisition by **The Borden Company** of **Columbus Coated Fabrics Corporation.** This major manufacturer of oil, nitrocellulose, polyvinyl chloride and acrylic-coated fabrics becomes a division of The Borden Chemical Company with former Columbus president, C. Gordon Jelliffe, heading the new division.

Spencer Chemical Company, implementing its announced intention to diversify into the packaging industry, bought two bag makers, **Crystal Tube Corporation** of Chicago and

To page 12

AS CP's EDITORS SEE THEM

Chem-trends



ABOUT PETROCHEMICAL PLANT SITES . . . .

Bayous get big one-company centers while Delaware Valley booms, too

One segment of the petrochemical industry is taking to the wilds — the Texas bayou wilds — perhaps for a reason that has long enticed others into virgin territory. This is deferment of complications and costs that organized communities can roll up so rapidly these days.

Another petrochemicals movement, impelled by the lure of nearby consumer markets and economical ocean shipment of monomeric and other raw materials, is gaining renewed momentum in the Delaware Valley.

In Texas, Gulf Oil's announcement of a 1000-acre petrochemical complex site at Cedar Bayou (near Mont Belvieu) will start off with a 400-million lb ethylene unit followed soon by polypropylene.

Monsanto's Chocolate Bayou petrochemicals complex is well known by this time except perhaps for the protective acreage factor — only 550 of the 3000-acre site will be required for the company's extensive program which will include a 500-million lb ethylene and co-products unit, plus huge oxo alcohols and aromatics units.

In the Delaware Valley, Cary Chemicals' PVC plant-to-be in pastoral Burlington Township will use ocean-toted monomer from Texas, a fact surely escaping no competitor.

But perhaps the most bullish news for plant site sleuths is Air Reduction's 22-mile-long nitrogen pipeline — the nation's longest — to stretch across the Delaware from Claymont (Airco's new air separation plant) to Woodbury (Shell Chemical) and down to Deepwater (Du Pont). With nearly half its 750 tons/day capacity still tappable for new customers, the new era of distributive service represented is considered likely to spur further development. ■

320,000-ton ammonia plant gets computer control

Big-scale production is usually undertaken with expectation of pushing costs down. Add computer control, as Allied is doing at one of the largest ammonia synthesis plants — at Ironton, Ohio — and what happens then?

This question is today on the minds of many industry insiders as word has gotten around about Allied's exciting new use of Thompson Ramo's well-established RW-300 digital computer.

To be used initially for closed-loop control of the most important areas of the ammonia plant, "the computer will also log plant operating data for later extension of on-line control to other plant areas."

For those interested in results, the waiting period will not be long. The schedule calls for the system to be in operation "before end of year." ■

Manpower — With military activity increasing, have you inventoried your Stand-by Reservists? The Engineers Joint Council thinks you should; the council also assumes that such reservists classified in either Category I-R or IV-R are subject to immediate call, the same as Ready Reservists.

If you are considering abandoning production at one facility only to resume it elsewhere, two recent Federal Court decisions indicate you may have to rehire "on the basis of seniority, those employees laid off" at the old plant during the period of removal. This "vested right" a worker would have in a job held for a period of years would not end with the termination of a current contract, nor would it even if his Union ceased to be a bargaining unit. A decision by Judge Kaess in Detroit confirmed an earlier Appeals Court action; issue now heads to the U.S. Supreme Court, the high tribunal's decision being of high significance.

Pollution — Removal of detergents from sewage in secondary streams (clarified) may be practical with ion exchange membranes, if an R&D project initiated by Ionics and supported by a grant from Dept. HEW proves out as hoped. The objective is to get water that can be re-used.

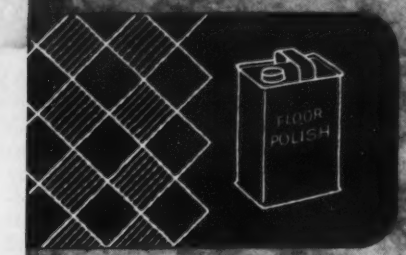
Substitution of natural gas for fuel oil is believed to have reduced substantially smog in the Los Angeles area, the Control District believes.

Process — Japanese' choice of the Chemico total-recycle urea process over their own Toyo process is said to be based upon comparison of actual plant operating experience.

Materials — Slurry rocket fuels, using liquid oxidizers with dispersed metallic fuel plus gas forming agents, is getting $3.2 million R&D boost at Atlantic research.

Production — Government statistics show 11 major chemical commodities reached higher production levels in first five months of 1961 than at anytime last year. These are: Ammonia, chlorine, oxygen, phosphoric acid, sodium hydroxide, sodium silicate, sodium sulfate, aspirin, DDT, ethyl acetate and synthetic methanol. Incidentally, March 1960 was the peak month.

Equipment — Up-turn of orders on the books of process equipment manufacturers for the first half of '61 averages about 25%, CHEMICAL PROCESSING learns . . . . could presage rightening of trade conditions, considering the stimulus of the Defense build-up . . . Jet engine drive booster pumps are finding pipeline use.



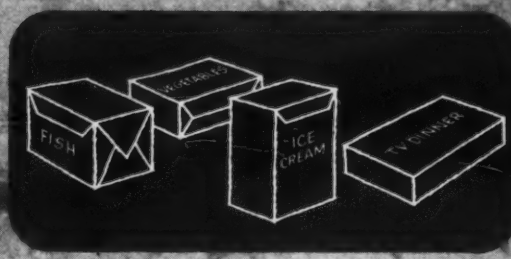
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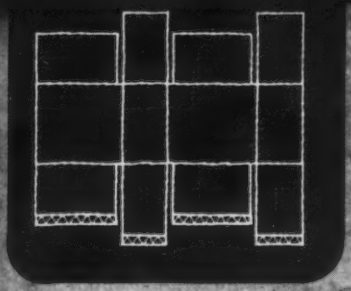
Low-molecular-weight polymers that improve a wide variety of industrial products and processes

Epolene polyolefin resins are chemical polymers whose physical properties are intermediate between those of paraffins and plastic-grade polyolefins. Their molecular weights range from 1500 to 10,000. Like waxes, Epolene resins can be melted and blended with many natural and synthetic materials, paraffins, and other resins. Yet, the physical properties of Epolene resins are superior to most waxes—they are tough, flexible, and chemically inert.

Epolene resins, singly or in combinations, contribute to improved performance in decorative moisture- and grease-resistant coatings for a variety of paper and paperboard products. They provide maximum toughness and durability in floor polish formulations. Hot-melt adhesive and laminating formulations based on Epolene resins provide strong, quick-setting bonds between such diverse materials as aluminum foil; all types of paper; and cellulose acetate, polyethylene, and polyester films. In textile emulsion finishes, Epolene resins improve the tear resistance, hand, and abrasion resistance of fabrics.

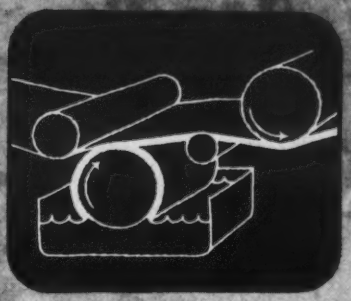
In these applications and in many other industrial processes and products, Epolene resins provide the means for improved performance and usefulness.

As indicated in the Tables, the basic types of Epolene resins vary in characteristics as their molecular weights or densities approach those of paraffin or a plastic-grade material. Some idea may be obtained from these Tables as to which Epolene resin will prove most suitable for your particular product or process. For more detailed information, and for technical assistance in selecting and using Epolene polyolefin resins, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.



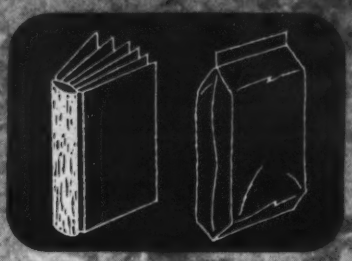
Corrugated Board Coatings

Hot-melt Epolene coatings specifically developed for use in high-speed curtain coating machines provide web or die-cut paperboard with a barrier against moisture and grease, and are highly resistant to abrasion. These clear, high-gloss coatings give a smooth, attractive finish that can be applied economically.



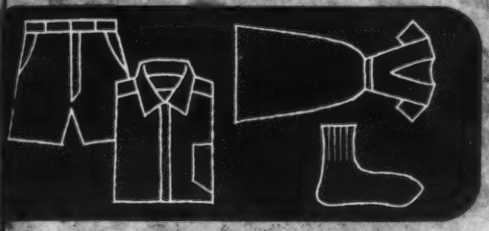
Paper Coatings

Hot-melt Epolene coatings applied by roll coating techniques on foil, parchment, kraft, glassine, chipboard, and most other paper stocks give these packaging materials an attractive gloss plus a high degree of moisture resistance and grease resistance. Such coatings can be formulated to make them readily heat sealable.



Hot-melt Adhesives

Economical hot-melt adhesives are formulated with Epolene resins for a wide variety of high-speed packaging and sealing operations. Applications include bookbinding, labels, and lamination of foil, paper, and plastic film.



Textile Finishes

Used primarily to improve the hand and drape of resin-treated wash-and-wear fabrics, Epolene emulsion softeners also significantly improve the tear strength and abrasion resistance of the fabric.

POTTING COILS AND CONDENSERS • CARBON PAPER
COTTON DUCK COATING • COATED PAPER FOR FIBER DRUMS
FOR COATING GLASS BOTTLES • LEATHER FINISHES
PAINT AND VARNISH • PRINTING INKS
EMULSION PAPER COATINGS • RUBBER COMPOUNDING
SLUSH MOULDING • AGRICULTURAL SPRAYS

Other Applications

There are many other applications for Epolene resins. Some are still under development, others are being tested and evaluated in processes and products. Please write for specific information in the area in which you are especially interested.

Emulsifiable Epolene Resins

wax-like properties ← → plastic-like properties

Effect of Molecular Weight on Viscosity

TYPE	E-14	E-11	E-12	E-10
Molecular Weight	1400	1500	1500	2500
Viscosity at 125°C., cps. (Brookfield)	300	375	410	2000

Effect of Density on Hardness and Tensile Strength

TYPE	E-14	E-11	E-10	E-12
Density	0.935	0.938	0.940	0.950
Penetration Hardness (100g./5 sec./77°F.)	3.5	2.5	2.0	1.5
Tensile Strength, psi	430	510	1300[a]	530

Non-Emulsifiable Epolene Resins

wax-like properties ← → plastic-like properties

Effect of Molecular Weight on Viscosity

TYPE	130° AMP PARAFFIN	N-12	N-11	N-10	C-12	C-10	C-11	TENITE 810[b]
Molecular Weight	325	1500	1500	2500	3700	7000	10,000	38,000
Viscosity at 125°C., cps. (Brookfield)	3	364	390	1990	900[c]	14,300	>25,000	>100,000

Effect of Density on Hardness and Tensile Strength

TYPE	130° AMP PARAFFIN	C-12	C-10	N-11	N-10	N-12	C-11	TENITE 3300[d]
Density	0.850	0.897	0.906	0.925	0.927	0.937	0.947	0.960
Penetration Hardness (100g./5 sec./77°F.)	15	11.5	2.5	2.0	1.5	1.5	<1	<1
Tensile Strength, psi	180	200	730	550	920	brittle[e]	1700	4000

a. Tensile strength is higher than density alone would indicate because of a higher molecular weight. b. An Eastman plastic-grade polyethylene. c. Chain-branching in this polymer reduces viscosity below that of more linear polymers, even at higher molecular weight. d. An Eastman high-density plastic-grade polyethylene. e. Too brittle to prepare film.

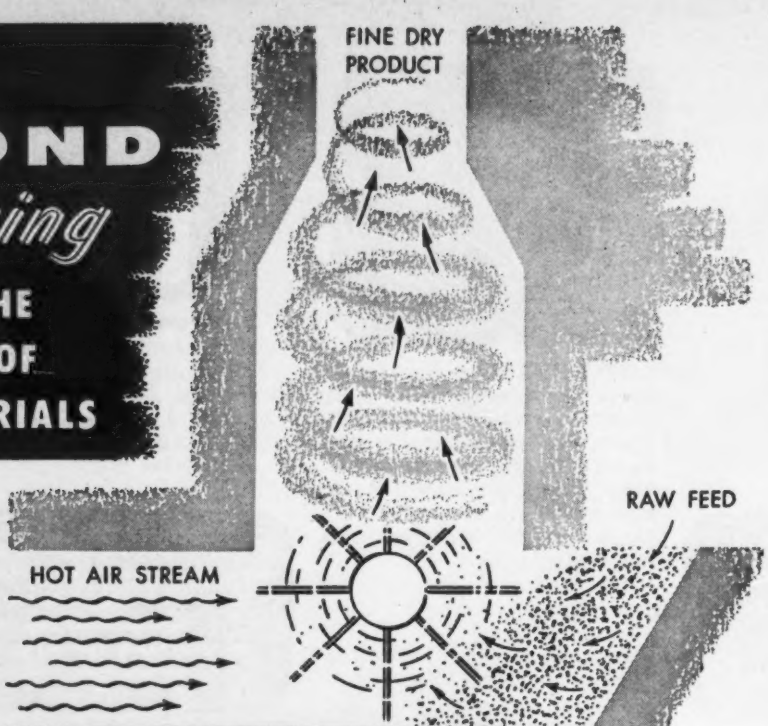
SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Boston; Buffalo; Chicago; Cincinnati; Cleveland; Detroit; Greensboro, North Carolina; Houston; Kansas City, Missouri; New York City; Philadelphia; St. Louis. **Western Sales Representative: Wilson & Geo. Meyer & Company,** San Francisco; Los Angeles; Salt Lake City; Seattle.

Epolene®

Eastman low-molecular-weight polyolefin resins

For more information on product at left, specify 5564 see information request blank opposite last page.

How RAYMOND Flash Drying SIMPLIFIES THE PRODUCTION OF POWDERED MATERIALS



Heated air is circulated through the system, and the raw material is simultaneously dried, disintegrated and delivered as a fine, dry, free-flowing product . . . one operation in a single, compact unit.

Today's bold ventures of science and industry into new fields make it necessary to utilize the most advanced methods and equipment to achieve the dramatic results now seen on every hand.

In the manufacture of powdered materials, Raymond Flash Drying stands out as a unique, modern system for simplifying processes, developing new products and handling special problems.

It is available with various Raymond units, as described below, providing wide ranges of application in the chemical and food industries.

with IMP MILL

For drying and pulverizing materials containing up to 80% moisture. Also for handling heat-sensitive products . . . blending and classifying . . . cooling and conveying to storage.

with ROLLER MILL

Removing surface moisture up to about 15% from non-metallics while grinding. For processing chemicals, pigments and manufactured products. Available in several sizes for large or small plants.

with CAGE MILL

For drying and disintegrating soft materials in a finely divided form. Built in sizes having capacities up to about 17,000 pounds of water evaporation per hour.

with AIR STREAM

For drying, without disintegration, materials of predetermined particle size. May be designed with multi-stage system for removing large percentages of moisture to a low final content.

FLUID BED DRYER — A supplementary form of Raymond Drying Systems for special applications. Used on a range of materials from fine synthetic resins to medium size granular particles such as organic crystals, also on many coarse natural materials. Useful on products requiring extended retention time and extremely low final moistures.

FOR FLASH DRYING UNITS WRITE FOR THE RAYMOND CATALOG NUMBER 82 P

FOR FLUID BED SYSTEMS WRITE FOR THE RAYMOND CATALOG NUMBER 88 P

If investigation shows that Raymond Flash Drying is compatible with your product . . . you have at your command an effective, economical method of improving your process.

COMBUSTION ENGINEERING, INC.

Raymond Division

Combustion Engineering-Superheater Ltd.
Montreal, Quebec, Canada

427 WEST RANDOLPH STREET • CHICAGO 6, ILLINOIS

Sales Offices in all Principal Cities

Check 5565 opposite last page.

OUR GROWING INDUSTRY

From page 8

Flexicraft Industries, Inc., of NYC while making arrangements to add **Perkins Glue Company** as a wholly-owned subsidiary. All three companies will continue to operate under their present management.

International Minerals & Chemical Corporation plans to swap common stock for all stock of family-owned **Aristo Corporation,** Detroit maker of binding materials for foundry cores. Aristo will be operated as an IM&C subsidiary with its president, George Abbott, continuing at the helm.

Chas. Pfizer & Co., Inc. is trading 300,000 shares of common stock for the assets and business of **New England Lime Co.** and its subsidiary, **Nelco Metals, Inc.** which produces high purity metallic calcium and magnesium in addition to limestone products.

Bucking the trend toward acquisition was the move taken by **Archer-Daniels-Midland** in divesting itself of its equipment division which acquires a new owner, **Altamil Corporation,** Indianapolis, and a new name, **M-E-C** (Manufacturing-Engineering-Construction) **Company.**

Federal Chemical Company, division of National Distillers and Chemical Corporation, adds three plants with the acquisition of **Farm Fertilizers, Inc.,** Omaha, Neb. This move, consummated via a stock exchange, gives Federal 10 plants and adds two states (Iowa and Nebraska) to its 12-state (now) marketing territory.

What may be one of the largest and richest sources of scarce beryllium has been uncovered at Bernic Lake, Manitoba, Canada, by **Chemalloy Minerals, Ltd.,** of Toronto. Lode of beryl ore is estimated at least 600,000 ton. Last year North America contributed 508 ton of 11,100 mined in world.

American Cyanamid Company and **Walker Manufacturing Company** have a catalyst-muffler combination which

they think will fit nicely into California's motor vehicle smog control program. Walker makes exhaust systems; Cyanamid, catalysts.

Ancon Chemical Corporation marked its appearance on the CPI scene by letting a contract for construction of $1-million petrochemical plant to **Blaw-Knox Company.** The plant should begin producing methyl chloride at a 60-million-lb/yr clip early next year from a Lake Charles, La., site. Ancon is jointly owned by **Ansul Chemical Company** and **Continental Oil Company.** Robert C. Hood is president.

ON STREAM . . . At Granite City, Ill., **Air Products, Inc.** has placed in operation $6-million facility capable of producing 170 ton/day of liquid and gaseous oxygen. At Torrance, Calif., **Dow Chemical Company's** polypropylene plant is expected to be operating on a full-scale basis within a few days. At **Suntide Refining Company's** Corpus Christi, Texas, refinery, a 30-million-lb/yr ethylbenzene plant is in production. At Baton Rouge, La., **Ethyl Corporation** has completed 25-million-lb/yr methyl chloride plant. At Gastonia, N.C., **United States Rubber** has completed second expansion this year of its spandex-producing capacity. Latest doubles its capabilities. At Garfield, N.J., **Heyden Chemical Division,** Heyden Newport Chemical Corporation, has brought on stream its 8-million-lb/yr fumaric acid facility. At Long Beach, Calif., **Monsanto Chemical Company** is operating its new unit capable of producing about 15 million lb/yr of phthalate esters. At Chalmette, La., **Tenneco Oil Company** has in operation a Houdriforming unit with design capacity of 6000 bbl/stream day. Also at Torrance, **Shell Chemical's** styrene capacity there has been expanded to 210 million lb/yr.

Universal Oil Products Company has earmarked $1.9 million for new plants and expansion of existing facilities. Of this total, $1,160,000 will go into a new section of the com-



WHATEVER THE FLUID . . . FUEL, CRYOGENIC, HYDRAULIC OR PNEUMATIC . . . SNAP-TITE COUPLINGS CAN HANDLE IT

Missile or space vehicle fluid—in fact almost anything that flows—can be (and is) handled through Snap-Tite quick connect, quick disconnect couplings, without contamination or loss.

Handling highly volatile and corrosive fuels, oxidizers, and cryogenic fluids is routine, even though temperatures of the latter go to —320°F. Developmental work is also being performed down to —420°F.

Hydraulic system pressures up to 4,000 psig (depending on surge conditions) and pneumatic system pressures up to 8,000 psig indicate the range of capacity and toughness of these couplings, available exclusively from Snap-Tite in 308,754 different combinations of size, end fittings and materials. Catalog 60, the most comprehensive ever published on quick connect couplings, provides detailed specifications and technical data.

For your own copy, write us on your letterhead.

☆ Snap-tite
UNION CITY, PA.

J-8103

Check 5566 opposite last page.

YARWAY news briefs

from **Yarnall-Waring Company,** *Philadelphia 18, Pa.*

BRANCH OFFICES IN 19 UNITED STATES CITIES • SALES REPRESENTATIVES THROUGHOUT THE WORLD
STEAM TRAPS STOCKED AND SOLD BY 270 LOCAL INDUSTRIAL DISTRIBUTORS

SOLID SUCCESS!

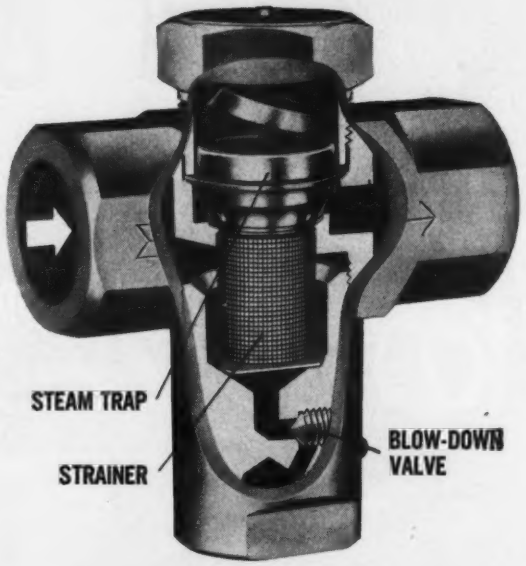
Yarway Series 130 Combination Steam Trap Wins Wide Approval

In chemical plants, refineries, other process plants, utilities, institutions—wherever condensate is handled in moderate amounts—this new Yarway Impulse Steam Trap is winning friends by the score.

Because it is a unique combination steam trap, strainer and blow-down valve, it offers these advantages no other steam trap can duplicate:

- IT SAVES SPACE—entire trapping hook-up requires no more space than a "T" fitting.
- IT SAVES MONEY—only one unit to buy and install, *up to 30% savings in time and materials.*
- IT SAVES WORK—easy to install, easy to maintain. Stainless steel construction. Good for all pressures 8 to 600 psi. Sizes ⅜" and ½".

Why don't *you* try a Yarway Series 130? Your nearby Yarway distributor can supply you—or write for Yarway Bulletin T-1743B.

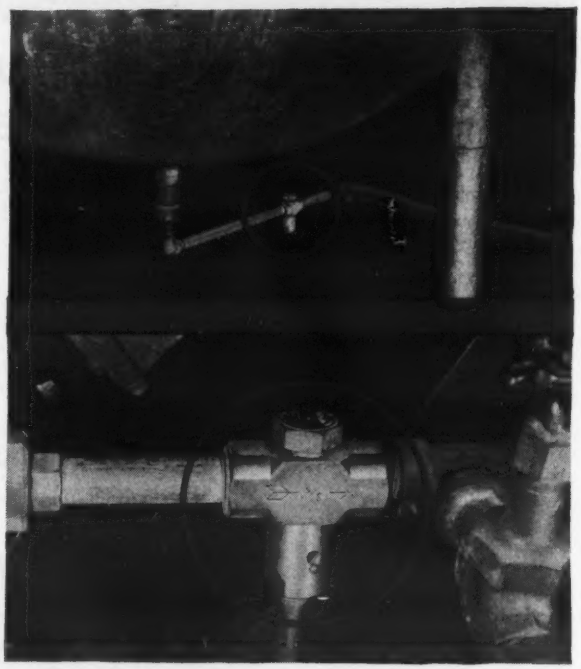


CHEMICAL PLANT REDUCES CORROSION FAILURE —LIKES "COMPACT" DESIGN

For years, traps and strainers of iron and steel were subject to HCl and H_2SO_4 acid corrosion failure in this chemical plant. Installations lasted only a few months. Now Yarway Series 130 steam traps are solving this corrosion problem because the trap, strainer and blow-down valve are combined in *one stainless steel body*. In addition, trapping hook-ups on processing kettles are greatly simplified.

LAUNDRY OVERCOMES SPACE PROBLEM...GETS FASTER HEAT-UP, NO WATER HAMMER

Space was at a premium for steam trapping around the presses in this laundry, and also they couldn't get fast heat-up without water hammer. Yarway Series 130 combination steam traps solved all three problems to their complete satisfaction.



Check 5567 opposite last page.

pany's catalyst plant and expansion of a chemical plant, both at Shreveport, La.

Plastic-producing capacity of **Humble Oil & Refining Company's** polyolefin plant at Baytown, Texas, will be increased 50% by November when expansion work is completed. Plant was originally rated at 40 million lb/yr.

Prompted by 500% expansion of markets for isocyanate chemicals in past five yr, **Mobay Chemical Company** will erect multi-purpose facilities capable of producing several hundred tons per month of a broad range of organic isocyanates. Plant, to be completed early next year, will be located adjacent to tolylene diisocyanate plant at New Martinsville, W. Va.

U.S. Industrial Chemicals division of National Distillers will surrender its lease on two U.S.-owned chlorine-caustic soda units at Huntsville, Ala., on Dec. 15. **Stauffer Chemical Company** will assume responsibility as of that date. U.S.I. has found new sources of supply located nearer its Tuscola, Ill., plant which used the chlorine for its ethyl chloride unit.

Stauffer is also erecting a multi-million-dollar captive chlorine plant at Dominquez, Calif. Output will go via pipeline to **American Chemical Corporation,** jointly owned by Stauffer and **Richfield Oil Company.**

AIC Chemical Company, division of Amerace Corporation, has changed its name to **Allegheny Industrial Chemical Company.**

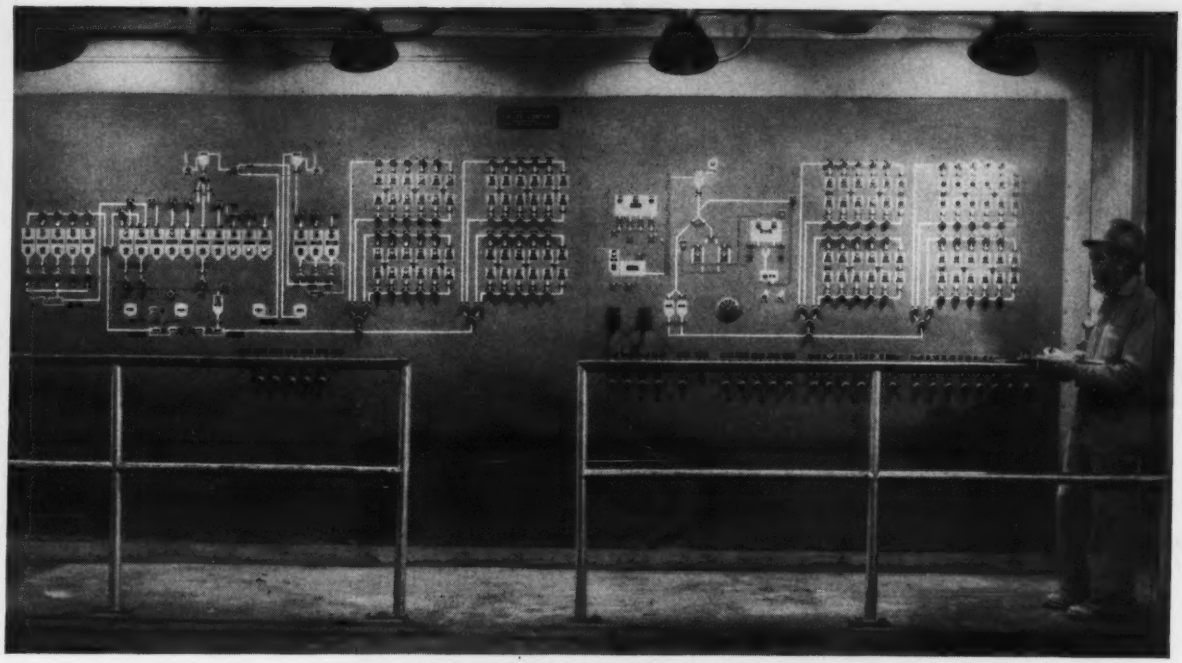
Olin Mathieson Chemical Corporation, spurred by a sharp pick-up in demand, is spending several million dollars to expand its ultra-modern aluminum rolling mill at Omal, Ohio.

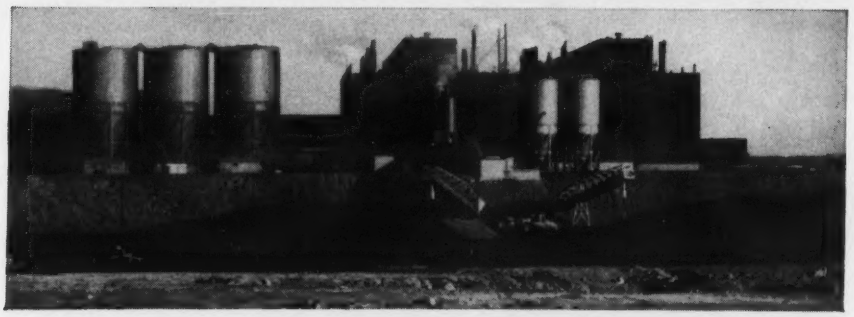
A 15,000-ton/yr sodium chlorate plant is being built at Lake Charles, La., by **Pittsburgh Plate Glass Company's** Chemical Division. It is to be producing by next September.

More "PAY-DIRT" With Fuller Panels In Control

One man on watch—and a Fuller Control Panel in control. Result: the flow of bulk, dry materials in a pneumatic conveying system graphically illustrated by diagrams and indication lights that track process transitions from phase to phase—without human errors!

Fuller Control Panels—automatic, remote, one-man control of multiple operations—stem from Fuller's vast materials handling and instrumentation experience. Fuller, the only manufacturer of pneumatic conveying equipment engaged in engineering and building its own control panels, puts its cumulative experience into each project. This single knowledgeable responsibility for both system and control means savings in time and costs. More important—it's your assurance that the total system is generic to your specific operational needs.





Look to Fuller's engineering-manufacturing team to develop the simplest possible control system without costly duplication or changes for you. Write for Bulletin G-9, today.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

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136 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

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....pioneers in harnessing AIR

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Check 5568 opposite last page.


Son, we call this
a "Fisher"

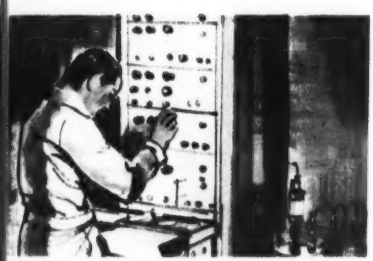
The worthiness of a name

In refineries, chemical plants, and oil fields, many "old timers" associate the name "Fisher" with high quality control valves and liquid level controllers. Through the years, in their work on instruments and controls, they have come to know that "Fisher" means dependability.

"Put a 'Fisher' in the line, and forget it." they would always say.

The quality found in Fisher equipment lies not only in metal and fiber and paint. It is also found in the practical design, manufacturing techniques, and the rigid inspection program. These high quality factors along with outstanding research and engineering facilities assure you of trouble-free performance. Throughout the world, "Fisher" means dependable control equipment.

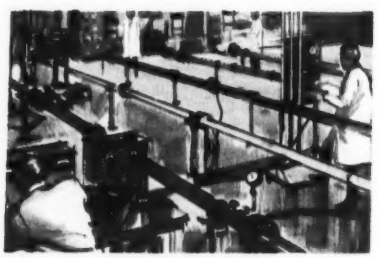
FISHER GOVERNOR COMPANY *Marshalltown, Iowa / Woodstock, Ontario / Rochester, England*



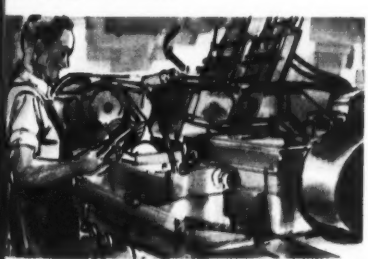
Continuous Advanced Research . . . Fisher research maintains a continuous program for development and use of new metals and materials to meet the increasingly severe conditions, encountered daily, in the nuclear and cryogenics fields.



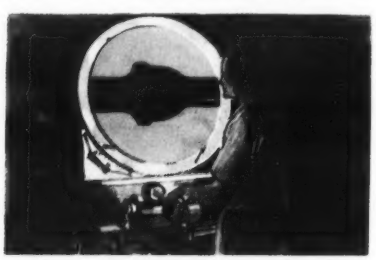
Engineering and Research . . . Almost three-fourths of Fisher's 41 graduate engineers have more than 10 years service . . . a total of 380 years experience in design engineering aimed at solving industry's flow control problems, practically and efficiently.



Testing and Development . . . Representative of the very latest and finest in equipment that aids Fisher engineers in the development of new and improved products is the recent addition of a test line that is capable of handling air or water pressures up to 2,500 psi.



Latest Production Methods . . . Various new style grinders produce a super-finish on Fisher valve guides and bushings, second to none in the industry. It is typical of precision manufacturing methods that assure long, trouble-free operation of Fisher controls.



Rigid Inspection Procedures . . . The highest ratio of inspection personnel to production personnel in the industry is maintained at Fisher. As an example, there are no less than 704 inspection operations on a 4" Type 657-A diaphragm control valve.



Efficient and Fast Service . . . "Supermarket" 36-hour delivery, from the factory, on popular sizes and types of controls is only one of many services available to Fisher customers. Seventeen sales offices throughout the country maintain field stocks for immediate delivery.

If it flows through pipe anywhere in the world ...chances are it's controlled by.....

FISHER® Controls

SINCE 1880


Need a quick solution?
Your pieces will fit
with NEW SOLUTIONS from
CHEMICAL PROCESSING



Spotlight On People

Four vice presidents elected by Atlas Chemical directors

Atlas Chemical Industries, Inc., has added four vice presidents. They are: **Robert P. Barnett,** general manager of the International Division; **Robert J. Reilly,** who continues as treasurer but relinquishes job of secretary; **Dr. Walter H. C. Rueggeberg,** R & D director and **W. Spencer Thompson,** industrial relations director. Thomas J. Laffey Jr., general counsel, is now secretary, also.

Recent changes in the Union Carbide Corporation family include: election of **R. K. Turner** as corporate vice president; **William B. Humes** succeeding him as president of U. C. Plastics; appointment of **Dr. D. M. Gillies** as director of research for Union Carbide Metals Company; appointment of **Dr. Milton Stern** as manager of research for Linde Company's Speedway, Ind., laboratories; naming of **Carl A. Odening** as administrative assistant, office of president, National Carbon Company division; and appointment of **Robert A. Charpie** as manager of advanced developments for the corporation.



BARNES



WALTON

Dr. Carl E. Barnes, who resigned recently as v.p. — research of Minnesota Mining and Manufacturing Company, has joined FMC Corporation in the same capacity. He is succeeded at 3M by **Dr. Charles W. Walton,** formerly vice president and general manager of 3M's adhesives, coatings and sealers division.

Felix N. Williams, Monsanto Chemical Company vice president, has been elected a director of Plax Corporation, owned equally by Monsanto and Emhart Manufacturing Company.

Newly-elected vice president for operations of Merck Sharp & Dohme Division of Merck & Co., Inc., is **Charles W. Pike.**

Chain-reaction, top-level shuffle at Kelite Corporation moves **L. C. Sorenson** up to chairman of board while continuing as chief executive. **William Sorenson** steps up to presidency and is succeeded as executive vice president by **Louis McDonald** who continues as technical director.

Joel R. Brown Jr. moves up from assistant to general manager of American Cyanamid Company's Surgical Products Division. Division offices have been moved from New York to Danbury, Conn.

Richard A. O'Leary is now assistant to J. Philip Smith, vice president of Chas. Pfizer & Co., Inc. and general manager of Pfizer Laboratories Division.

John M. Archiable, who assumed responsibility for Emery Industries, Inc., manufacturing and foreign operations earlier this year, has been appointed a director.

Graham B. Brown has joined Stauffer Chemical Company as general manager of Metals Division, Richmond, Calif.

General Electric's chemical materials department at Pittsfield, Mass., has a new general manager, **John T. Castles.**

Joseph W. Calby is now manufacturing coordinator of Enjay Chemical Company's Plastics and Resins Division.

Onyx Chemical Corporation

UNCOMMON UNCOMMON

Specialists in CLOTH from METALS

PLATINUM
GOLD-SOLID
GOLD-PLATE
MOLYBDENUM
SILVER
TANTALUM
TITANIUM
TUNGSTEN

And not only do we weave mesh cloth in these metals to order but we carry some items in stock. We also fabricate inserts, strainers and other parts to order, utilizing our own 'uncommon' mesh cloth.

Why not phone us—Newark, N. J. HUmboldt 3-7700 —regarding your requirements for wire cloth made of an uncommon metal? It will expedite matters and we might be able to help you in your selection.

As background for this kind of work, we can point to more than fifty years of wire cloth making, during which time we have made cloths of practically every metal that can be drawn into weavable wire.

NEWARK for ACCURACY

Newark Wire Cloth COMPANY

351 Verona Avenue • Newark 4, New Jersey
Teletype: NK607 • Tel.: HUmboldt 3-7700
Representatives in all principal industrial areas

Check 5569 opposite last page.

has established a Finishes & Coatings Division with **Philip E. MacLean** as manager.

James McWhirter, general manager of Industrial Chemicals division, Pennsalt Chemicals Corporation, is now a vice president.



McWHIRTER



WISHNICK

William Wishnick has succeeded **Rudolf G. Sonneborn** as president and chief executive of Sonneborn Chemical and Refining Corporation, subsidiary of Witco Chemical Company, Incorporated. Sonneborn is now chairman of board.

Roland M. Avery Jr. has been named executive vice president of Allerton Chemical Company, Inc. with responsibility for coordinating overall operations.



AVERY



WILSON

Founder and president of Tec Chemical Corporation prior to its merger with Reheis Company, **Robert W. Wilson Jr.,** has been named executive vice president of Reheis. **Daniel C. Reheis** has been appointed production manager and purchasing agent of the company.

As technical assistant to the president of Air Reduction Chemical & Carbide Company, a division of Air Reduction Company, Inc., **Dr. Thomas H. Manninen** will review and evaluate plans for new plants, plant expansions and improvements. ■



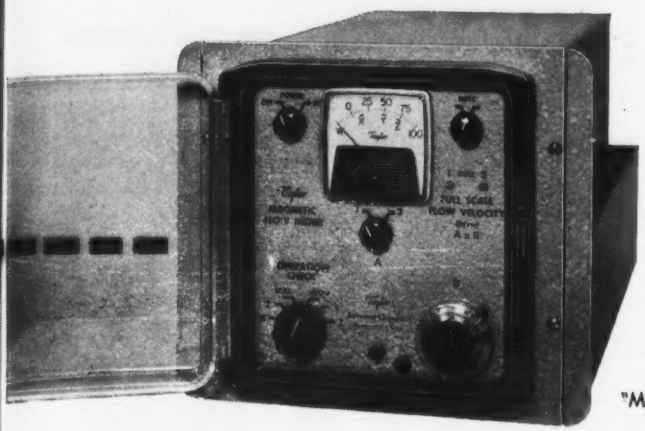
712NE
"MAG-PIPE" Sensing Head

Taylor presents a **MAGNETIC**

OUTSTANDING FEATURES

- High accuracy—½% of full scale on most ranges.
- Full scale velocities as low as ½ ft./sec., at only slightly reduced accuracy.
- Conductivity range—as low as distilled water.
- Rangeability—½ to 30 ft./sec. full scale calibration, continuous vernier adjustment.
- Amplifier—solid state.
- Ideally suited for long transmission runs to a central control panel.
- Output signal—1-5 ma DC into any load from 0-3000 ohms. (Electro-Pneumatic Transducer or TRANSCOPE Electronic Control System).

Taylor Instruments



717TE
"MAG-PIPE" Transmitter

FLOWMETER TRANSMITTER WITH 1/2% ACCURACY

The new Taylor "MAG-PIPE" Magnetic Flowmeter Transmitter is a high quality, high performance transmitter with an output signal of 1-5 ma suitable for transmission over long distances. It can therefore be used with miniature receivers and controllers in central control rooms.

It is designed to measure flow of fluids with an electrical conductivity as low as that of distilled water. It is ideally suited for very low flows, viscous liquids and liquids containing suspended solids, since the flow is not in any way restricted by the primary element.

The "MAG-PIPE" sensing head is mounted in the flow line. It comprises a flow tube, an AC magnetic circuit and two electrodes. The sensing head housing is "hose-down proof" (explosion-proofing optional), and has Van Stone type flanges for easier, faster installation.

The transmitter employs *solid state* components, being fully transistorized for long-term reliability. It is standard in fixed-range form, in which case calibration is factory set at the desired range. Optionally available with a full-scale vernier adjustment on two ranges. A built-in output meter doubles as a circuit checking device.

The "MAG-PIPE" Flowmeter Transmitter is in production. Consult with us on your difficult flow measurement problems. See your Taylor Field Engineer or write for **Bulletin 98418.** Taylor Instrument Companies, Rochester, N.Y., and Toronto, Ontario.

MEAN ACCURACY FIRST

Check 5570 opposite last page.

letters from readers

Methyls, not metals

Gentlemen:

Your unusually excellent and usually accurate journal made a small slip in reporting on the Hallcomids produced by The C. P. Hall Company of Illinois (July 1961 CP, pages 56-57).

Although "metal" groups might be useful and interesting if used to replace the hydrogens attached to the nitrogen, we regretfully can offer only *methyl* groups.

We sincerely hope that the previous paragraph where the *methyl* groups are quite properly attached to the nitrogen will be the most carefully observed by parties interested in using hallcomids.

Of the periodicals which are sent to us, no other is more useful or more thoroughly read than CHEMICAL PROCESSING. Thank you for sending it and keep up the good work.

C. ROBERT HALL
Chairman of the Board
The C. P. Hall Company
Akron, Ohio

Houz yer grammer? (Arz ain't sa gud!)

Sirs:

Until we read your July issue (page 11), we were pretty proud of the "computer-tutor" that System Development Corp. had devised, using our Bendix G-15 computer as the control element.

Our machine has been shown here and there, demonstrating its prowess in the rather mundane task of teaching history, but French "grammer" (which the University of Illinois machine will handle), that's another story.

In tribute to the U. of I. achievement, I dedicate this little ditty:

The "tutor" that teaches
French grammer
Should try not to sputter
or stammer
For, if it can't spell
The student can tell
The darn thing has lost all
its glammer

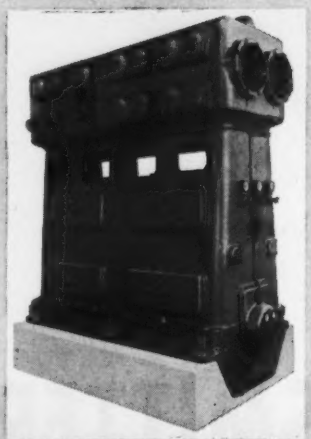
Seriously, as an editor, I can

COMPRESSION!

☐ NO LUBRICATION ☐ NO CONTAMINATION ☐ NO MAINTENANCE

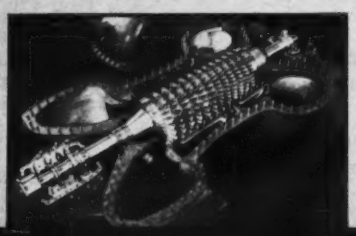
SULZER NON-LUBRICATED RINGLESS PISTON COMPRESSORS

...are available for capacities from 10 to 4,000 cfm and discharge pressures up to 650 psig. The construction of these compact, standardized 1, 2 and 3 stage units are the result of Sulzer's 25 years of experience in their design and manufacture. These compressors also have a unique ringless piston and frictionless piston rod stuffing-box which requires little or no maintenance and assures absolutely contamination-free compression of Air, Oxygen, Hydrogen, Dry Chlorine and other Industrial gases. Sulzer Non-Lubricated, Ringless Piston Compressors are also available for refrigeration with capacities from 400,000 to 4,000,000 B.T.U./h. Suitable for extremely low temperatures, these Dry Piston Compressors cannot contaminate the refrigerant, preventing the formation of oil films in evaporators and condensers.



SULZER AXIAL COMPRESSORS

...are available for suction volumes from 20,000 to 300,000 cfm and pressure ratios up to 5 in a single casing. Proved exceptionally economical, dependable and trouble-free for Chemical Processing, Blast Furnace and Wind Tunnel application, Air Separation Plants, etc., the Sulzer Axial Compressor features a patented blade design which resists erosion and remains unaffected by fouling.



SULZER CENTRIFUGAL COMPRESSORS are available with capacities from 2,000 to 30,000 cfm.

For further information and specifications contact:

SULZER

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Check 5571 opposite last page.

LETTERS

sympathize with you because I know these typographical errors get in despite the best efforts of proof readers, but this was one I couldn't resist.

Congratulations on a fine publication.

TOM HORAN
Bendix Computer Division
The Bendix Corporation
Los Angeles
California

Professional registration

Sirs:

We have had many fine comments on your article "Registration for Engineers —optional or required?", which appeared in the March issue of your publication. In fact, it was suggested that we reprint the article in THE EXPONENT, official publication of the Iowa Engineering Society.

WALTER T. PROCTOR
Editor
THE EXPONENT
Iowa Engineering Society
Des Moines, Society

YOUR OPINIONS —

— and comments on the significant subjects carried in each month's CHEMICAL PROCESSING are important! We welcome your letters expressing your views. Many CP readers are taking the opportunity to state their views on today's top questions.

By publishing your letters in CHEMICAL PROCESSING others will have the opportunity to hear your side.

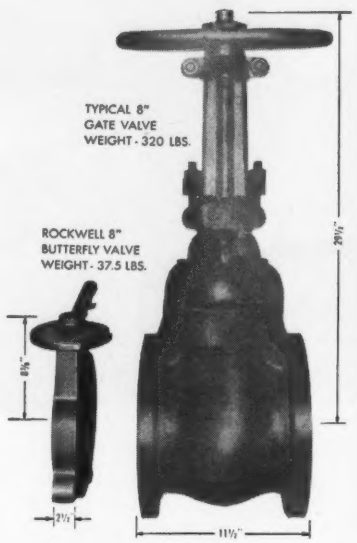
Perhaps you agree

With what has been written in these articles.

Maybe you don't.

You might even have a thought or angle which wasn't expressed. If so, why not let us and others hear your ideas? Suitable letters will be published in the regular "Letters from Readers" columns. Address your comments to: The Editor, CHEMICAL PROCESSING, 111 E. Delaware Place, Chicago 11, Illinois.

Compare them
✓ for Weight
✓ for Space



This Rockwell resilient-seated wafer butterfly valve and the large gate valve are both 8" pipe size. Both do the same job. But what a difference in weight, space—and cost.

What does this mean? It means a 60 to 80 per cent reduction in weight in favor of the butterfly valve, depending on size.

As for space, the 8" butterfly valve requires but 8⅜" from center line of pipe for clearance, whereas the gate valve requires over 37" from center line for clearance, when the valve is open.

There are other advantages, too: A quarter turn opens and closes the butterfly valve. The gate valve, however, requires many turns. And operation is easier; maintenance is lower.



Fact-packed Bulletin 590X tells more. Write for it.

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Check 5572 opposite last page.

recent books

A concise survey of the chemistry, manufacture and use of pigments and pigmented coatings is contained in "Organic Coating Technology, Vol II", edited by Henry Flemming Payne. This book is intended to be used with "Oils, Resins, Varnishes and Polymers, Vol I" which outlined the film-forming materials for both clear and pigmented coatings.

Throughout both works, the specific formulations are offered to support basic theory. Sufficient discussion of basic theory is included to provide a working knowledge of the physics and chemistry.

Since the two volumes are intended to be used together, the chapters and pages of both books are numbered consecutively, and a combined index has been provided in this second volume. Some of the topics discussed in this volume include white, extender, inorganic and organic pigments, architectural and industrial finishes, corrosion-resistant and chemical-resistant paint systems.

To obtain "Organic Coating Technology Vol II", remit $17.50 directly to John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York.

Check 5573 opposite last page.

"Gas Chromatography" devotes particular attention to a comprehensive account of applications and detailed description of apparatus used. There are more than 400 literature references. Appendix contains selectivity coefficients and over 2000 retention volumes. The book is of particular usefulness to chemists concerned with analysis or separation of organic or inorganic substances having boiling points to 450°C.

The author, Ernst Bayer, has been a lecturer in organic chemistry at Technical University of Karlsruhe since 1958. "Gas Chromatography" is published by Elsevier Publishing Co., Amsterdam, The Netherlands.

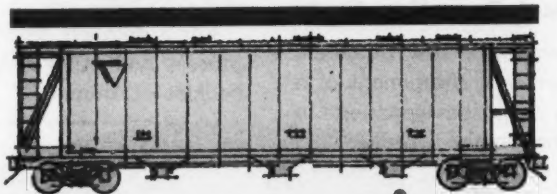
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A widely accepted authoritative compilation of facts, data, tabular material and experimental findings covering every aspect of chemistry, Lang's "Handbook of Chemistry", Tenth Edition, meets the needs of those who cannot command the unlimited time available to research specialist or who lack the facilities of a large technical library. Reference volume contains everything from simple conversion tables for weights and measures to an encyclopedic listing of over 6500 organic compounds with their important physical constants.

Comprehensive index of 27 pages contains nearly 3000 entries. Tables of synonyms as footnotes to

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General American designed its new DRY-FLO CHEM Car to protect plastic resins from contamination and moisture pickup. It is being used by 18 of the major producers of polyethylene, polystyrene and polypropylene. The unique feature which makes this car better than any other for bulk transportation of contamination-sensitive, free-flowing solids is General American's patented nozzle for pneumatic unloading.

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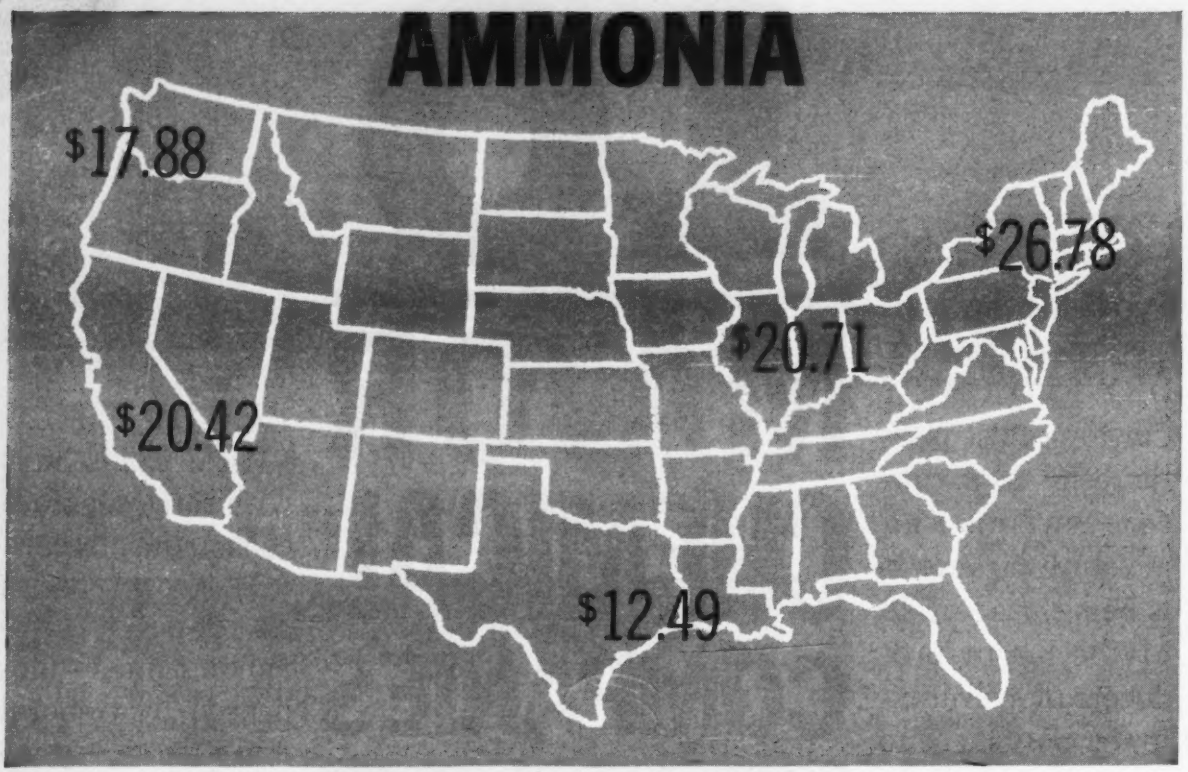
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MORE PROFIT WITH AMMONIA



Kellogg Steam Methane Reforming Process Sets New Lows in Direct Operating Costs

Wherever you may be planning a new ammonia plant—for ammonia alone or as a component of a complete fertilizer complex, recent developments in Kellogg Steam Reforming now make a Kellogg-designed ammonia plant more economical than ever to operate as well as to build.

The figures shown above are direct operating costs per ton for five major U.S. areas. They are based on rates given in the utility table (right). Catalyst and chemical consumption have been included—at 34¢ per ton of ammonia product and 7¢ per ton, respectively. Labor, maintenance, taxes, insurance, depreciation and interest have not been included since these vary with individual client situations.

Feedstock for the process in this case is natural gas. Comparable low operating costs are possible with refinery gas feed, or even naphtha, under certain circumstances.

For a detailed description of Kellogg's ammonia process and other data, write for the new 12-page booklet—"Ammonia".

UTILITY UNIT COSTS*

	EAST COAST	GULF COAST	MID-WEST	PACIFIC NORTHWEST	WEST COAST
Natural Gas—Feedstock and Fuel, ¢/MM Btu	59	20	40	38	37
Electric Power, ¢/KWH	0.7	0.6	0.8	0.5	0.9
Cooling Water, ¢/M Gals.	2.4	1.8	2.5	2.2	2.2
Steam, ¢/M Lbs.	65	32	67	56	56

Cost of steam is based on minimum fuel cost for each area

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RECENT BOOKS

the tables of inorganic and organic compounds facilitate finding of chemical compounds under any one of many possible terms.

To obtain "Handbook of Chemistry," Tenth Edition, remit $11.00 direct to McGraw-Hill Book Company, 327 West 41 Street, New York 36, New York.

"Monographs in Statistical Physics and Thermodynamics, Vol. II" proceeds from classical non-relativistic thermodynamics to development of statistical mechanics of systems of weakly interacting particles. General principles rather than detailed applications or physical mechanisms are emphasized.

To obtain a copy of "Monographs in Statistical Physics and Thermodynamics, Vol II", remit $14.50 direct to Interscience Publishers Inc., 250 Fifth Ave., N. Y. 1, N. Y.

Check 5577 opposite last page.

Written for the men in industry who are responsible for design, installation and operation of equipment for generating heat and power, "Boilers: Types, Characteristics, and Functions", by Carl D. Shields, covers all practical aspects of the subject. Encyclopedic guide is both detailed and thoroughly understandable, using over 500 photographs and clear, detailed drawings to assure even the most inexperienced reader of a basic comprehension of heat and generating equipment and practice.

This book of 559 pages provides a little theory and a wealth of descriptive and practical information in 32 conveniently organized chapters within six major sections.

To obtain "Boilers: Types, Characteristics, and Functions", remit $15.00 direct to F. W. Dodge Corporation, 119 West 40th Street, New York 18, N.Y.

Check 5578 opposite last page.

New addition to the source book series, "Source Book of The New Plastics, Volume 2", covers new materials and processing in the plastic industry through most of 1960. It presents significant information on important new plastics: their properties, production, price, application and selection. An outstanding feature is chapter on the technical progress, which includes articles on stereo-specific catalysts, block and graft polymers, fluorocarbon nomenclature, Montecatini developments and urethane foam progress.

To obtain "Source Book of The New Plastics, Volume 2," remit $8.95 direct to Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y.

THAT'S INTERESTING

Computer to advise

An Air-Force-sponsored study by University of Pennsylvania researchers has come up with the conclusion that a digital computer can be taught to give advice.

The researchers also believe that a computer can dream. Letting a computter dream is analagous to letting it predict willy-nilly.

In continuing experiments, the researchers hope to devise a model of a computer program that will allow input of data in natural language.

Germinating jolted

Germination of alfalfa seed was increased 35% by exposing the seeds to radio frequency energy for 28 sec at a frequency of 39 megacycles per second and field intensity of 3000 volts per inch.

USDA made the study.

For more information on product at right, specify 5579 see information request blank opposite last page.

symbol of modern valve design. Announcing Continental's new 8", 10" and 12" Teflon-sleeved, non-lubricated plug valves. Now, for the first time, Tufline's proven design features ... pre-stressed pure Teflon® sleeve, sculptured body bore, bubble tight performance ... can be obtained for larger piping. Advantages: quick, easy operation [manual, automatic], no flow pockets, 150# rated for light gases to heavy slurries and corrosive services. Also available in bottom entry 3-way design and choice of metals. Write Continental Manufacturing Co., 230 Park Ave., NY 17, NY



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Check 5580 opposite last page.

Watching Washington

New Pollution-control Law Won't Cause CPI Anguish

The CPI need not fear the new federal water-pollution-control act. The Public Health Service plans no sweeping attacks against industry under the act. Nor could such campaigns be carried out.

Under the new act, pollution-control enforcement is almost unchanged so far as industry is concerned. The act's principal feature is a 60% increase in grant funds for municipal sewage-treatment facilities. The two minor changes in enforcement provisions are insignificant in practice:

1) In the past, only state governors or waterways boards could call in the PHS on a pollution problem. Now, municipalities may ask for federal help, but only if the governor or state-waterways board concurs in the request.

2) Under former provisions, if a pollution situation was intrastate in nature, the state could ask only for technical assistance. Now the state can ask the Secretary of Health, Education, and Welfare — the HEW Secretary designates the Public Health Service — to run a conference on the problem instead of just providing advice to a conference run by the state.

Even the Public Health Service's Division of Water Supply and Pollution Control agrees that, in practice, there can be virtually no change in enforcement under the new act. Nor does division chief Gordon McCallum seek changes. His major complaint is not against industry, but against cities that refuse, or cannot afford, to spend enough money for proper sewage treatment. The major increase in aid funds available is expected to change many cities' attitudes. The small, but significant, increase in general funds for salaries, training or local research will further help McCallum's division clean up the nation's water supply.

McCallum says he has long realized that industry — and especially the chemical industry because of the nature of its wastes — has been progressive in its spending on pollution abatement. As a rule, he said in answer to a question, whenever a chemical processor is informed of a bad pollution situation, the processor immediately seeks ways to remedy it.

Further, the water-pollution-control chief appreciates the money that chemical processors spend on pollution abatement research. John E. Hull, president of the Manufacturing Chemists' Association, reported that chemical processors spend $100 million per year on pollution research. McCallum points out that this is $100-million per year that does not have to come out of Public Health Service funds. He adds that almost invariably the results of the industry's own research are communicated rapidly to the PHS.

What then is Washington's complaint against chemical processors with respect to water pollution?

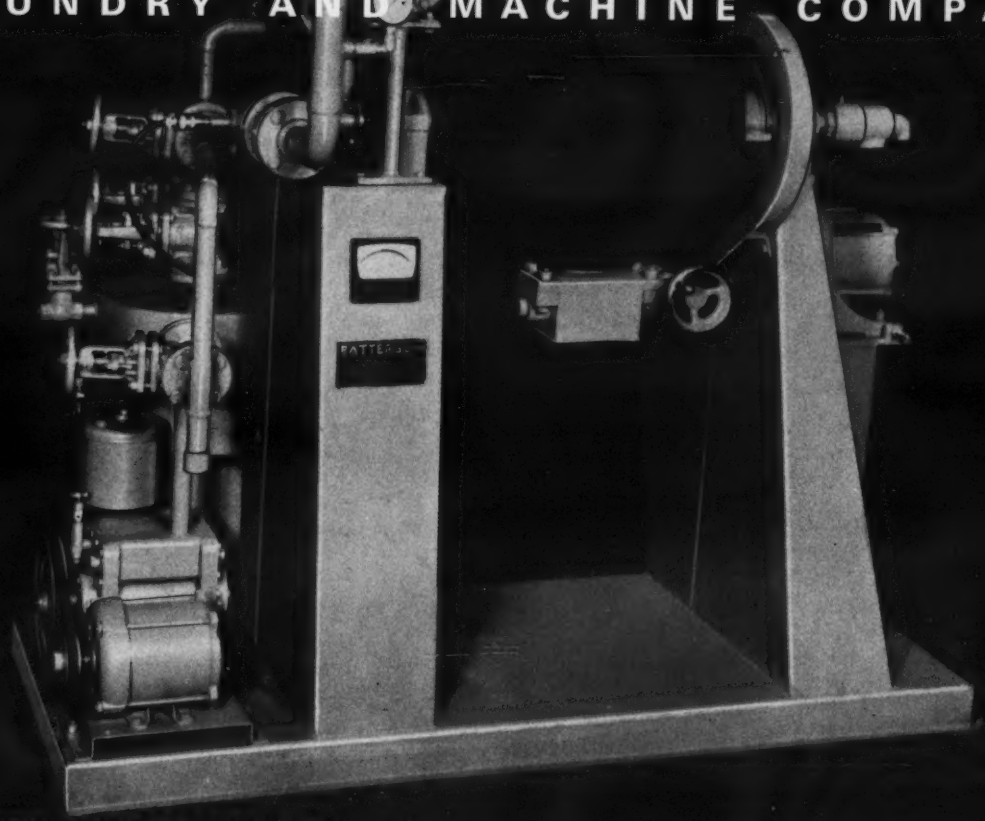
There is no complaint.

The Public Health Service has a complaint against chemicals, but it is against the growing and often indiscriminate use of the industry's products, not against the industry itself. Surgeon General Luther Terry — and his predecessor, Leroy Burney — has several times called attention to the increasing use of detergent chemicals and the resultant mounting sewage treatment problem. Yet, neither Public Health Service head has blamed chemical processors for providing needed and useful products.

In spite of misinterpretations by the industry's alarmists, PHS officials point out, all the surgeons general have asked is for a wider community realization that 1920's sewage

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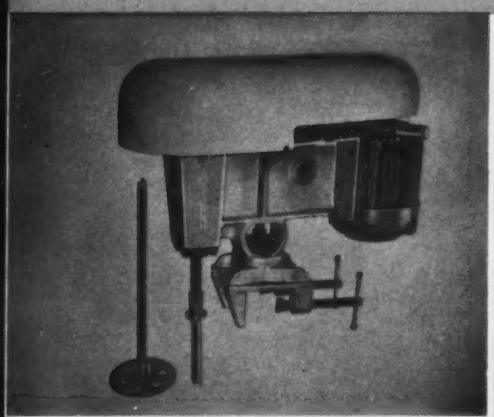
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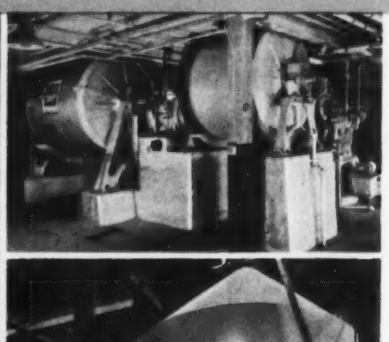
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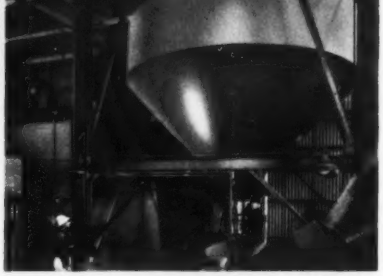
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Pebble, Tube & Ball Mills Illustrated are ball mills which have been operating continuously for more than 20 years at the Stanley Chemical Company of East Berlin, Connecticut handling batches from 5 gallons to 1000 gallons with little or no attention. Patterson mills are available in every desirable type and size for all grinding purposes. For your specific requirements, be sure to contact your local Patterson representative.

Thoro Blender This is considered to be the world's finest conical blender for achieving absolute homogeneity in dry materials.

Charging is rapid, operation easy and dustless and discharge is speedy, thorough, and direct. In the chemical processing and other fields, this unit has been acclaimed for its durable qualities and excellent mixing capabilities. All types of products from synthetic, fine and heavy chemicals, dyes, resins, grains and feeds, and hundreds of other products can be mixed with a THORO BLENDER! Get the full facts on how this unit can save you dollars on initial installation and during operation. (Liquid may be introduced if desired)

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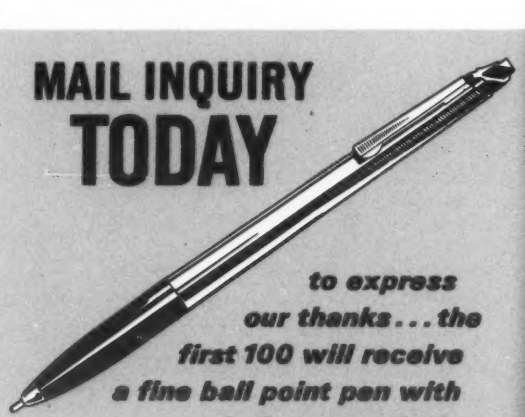
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Litho in U.S.A.

treatment facilities must be modified and expanded to handle the problems of the sixties.

Following a review recently of the over-all problem, the new surgeon general announced the first major revision of United States drinking water standards since 1946. General Terry pointed out that previous standards had set no limits for some potentially toxic chemicals in drinking water sources. And the previous standards did not encompass concentrations of radioactivity in water.

The standards regulate only the drinking water used on trains, planes, buses and other interstate vehicles . . . and at certain federal installations. However, many states and communities also automatically adopt the federal standards as guide for their own drinking-water laws.

In addition to regulating concentrations of radium-226, strontium-90, and gross beta activity, the new standards set limits for the following chemicals not previously regulated:

Detergents — alkyl benzene sulfonate.

"Exotic" organic chemicals — barium, cadmium, carbon chloroform extractables.

Others — cyanide, nitrate, silver.

What will these new standards mean to the chemical processor? Nothing, so far as federal enforcement is concerned. However, they most likely will become state laws with local enforcement provisions. Further, if the processor's plant affects a municipality's arrangements with an interstate carrier, a complaint under the new pollution-control act can be expected.

The new standards, and a comparison with the 1946 standards, are available from the U.S. Public Health Service, Washington 25, D.C.

How, then, will the PHS clean up the nation's streams if it has virtually no additional enforcement authority under the new act? McCallum says PHS will proceed as it has

For more information on product at left, specify 5581 . . . see information request blank opposite last page.

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PACIFIC FOUNDRY
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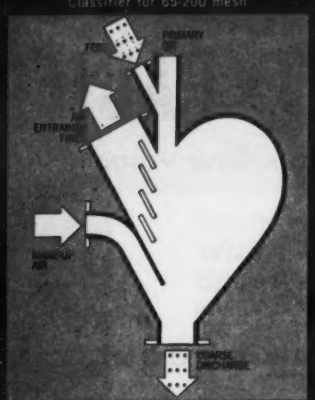
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Check 5583 opposite last page.

WASHINGTON NEWS

been, very effectively, in the immediate past. Public Health Service will continue to bring its big guns — conferences, publicity and threat of potential court action — to bear on individual areas: one river after another. Example: Clean up the Red River, the Colorado River, then the Great Lakes.

Asked whether he had enough money under the new act to carry out this clean-up, McCallum replied in a manner almost foreign to Washington:

"Oh, yes. I'm very optimistic about the money. There's enough to get along. We might even be able to get along with a little less after a while."

McCallum's optimism is not without foundation. He points out that his comments certainly will hold for the smaller, rural states where sewage systems are starting to catch up with the populations. As for the large, urbanized states, he believes that the 60% increase in grant funds, which must be assisted five to one by local authorities, will bring them up to standards within a decade. "Unless," he cautions, "everybody decides to start moving to New York and California; then, we're in trouble."

The chemical industry's reaction to the new water pollution control act was mostly in the nature of praise. Representative is MCA president John E. Hull's observation:

"The law recognizes that despite the excellent efforts of the various water-pollution-control centers throughout the country, there still remains a need for increased research.

"In aiding communities to construct adequate treatment facilities the law now provides for two or more communities to act jointly to construct such facilities. It also recognizes the primacy of local responsibility in providing effective pollution control.

"The chemical industry . . . is gratified that the new legislation supports state and interstate agency programs with which the industry has worked effectively in the past." ■

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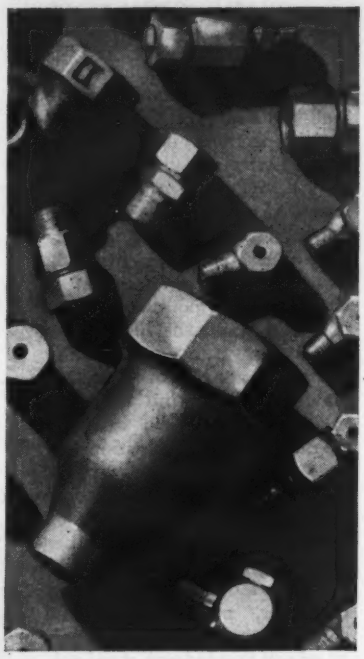
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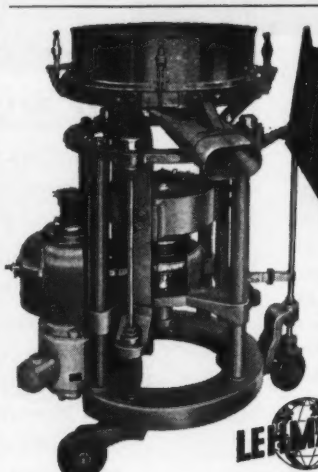


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Check 5584 opposite last page.



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OPERATING MANAGEMENT'S OWN MAGAZINE

CHEMICAL PROCESSING

September 1961

U.S. oxygen production could triple by 1970

INDUSTRIAL CRYOGENICS

Chemical industry may replace steel industry as the No. 1 oxygen user —

with such products as ethylene oxide increasingly swinging to oxygen instead of air . . .

and possibility that such chemicals as sulfuric acid, nitric acid, acetic acid and oxo alcohols may be made with oxygen in the U.S. as is now done in foreign countries

By A. J. DONIUS
Air Products and Chemicals, Inc.

Quantity of oxygen used in U.S. for various chemicals during 1960

Chemical	Tons/Year
Acetylene*	900,000
Synthesis gas (ammonia and methanol manufacture)	900,000
Propane, butane oxidation products	150,000
Ethylene oxide	125,000
Other	125,000
TOTAL	2,200,000

*Byproduct $CO+H_2$ are frequently used to produce methanol or shifted to hydrogen for ammonia production.

IT IS NOT generally recognized that oxygen is one of the most widely and frequently used chemicals in the U.S.

In 1955, when approximately 2¼ million tons were produced, oxygen ranked about ninth in chemical production. In 1960, U.S. Department of Commerce figures indicated that oxygen production was exceeded only by ammonia and some of the time-honored inorganics — sulfuric acid, chlorine, sodium carbonate and sodium hydroxide. However, government figures do not include oxygen used in the manufacture of ammonia. The addition of this quantity to the Department of Commerce figures makes oxygen a prime contender for second place behind sulfuric acid.

In the last five years oxygen production has about doubled, reaching 4½ million tons last year. The predictions for the next decade are that oxygen production will triple, reaching about 14 million tons by 1970. (All these figures exclude oxygen produced in government-owned facilities.

Nearly All Oxygen Made By Cryogenics

Oxygen is the most abundant element on earth. Almost half the weight of the land, 23% of the air and nearly 90% of the sea consist of oxygen. Many techniques, including diffusion and adsorption, have been investigated as means of producing oxygen. However, only the electrolysis of water and the liquefaction and subsequent distillation of air have accounted for any appreciable production.

In 1929 the electrolysis of water accounted for about 10% of the total U.S. oxygen production. Today the low-temperature distillation of air accounts for about 99% of all domestic output. The cryogenic separation of air should continue to hold its overwhelming dominant position in the U.S.

In nations where hydrocarbons are scarce and hydroelectric power is plentiful and cheap, water is electrolyzed to obtain hydrogen for ammonia manufacture. In such cases, the impure oxygen obtained as a byproduct, may or may not be utilized. One example of wasted oxygen is in Norway where more than 1000 tons per day of byprod-

To next page

U.S. oxygen production could triple by 1970

From preceding page

uct oxygen are vented. This situation, which occurs at a fairly inaccessible site, is in contrast to the majority of cases where byproduct oxygen is used.

Oxygen Speeds Reaction

Why is oxygen used, when air, which is relatively free, is available everywhere? Basically, the use of oxygen results in an intensification of the process in which it is involved. When pure oxygen replaces air, the diluent effect of nitrogen is eliminated.

The principal advantages of using oxygen follow. With "air enrichment," the same advantages would also occur, although not to the same degree.

1) **Higher reaction temperatures** — Since no nitrogen is present, all the heat liberated in the reaction is used to increase the temperature of the raw materials and products, producing faster reaction rates.
2) **Easier product separation** — Nitrogen is inert and liquefies at an extremely low temeprature (−320°F) and, therefore, is not an easy element to separate. This advantage is most pronounced where the product or valuable byproducts are gases.
3) **Higher partial pressure of reactants** — Like higher temperatures, higher concentrations increase reaction rates. Faster rates of reaction and less gas volume mean that the same production can be achieved with smaller equipment or more production with the same size equipment. In some processes, because of better heat utilization, the use of oxygen eliminates the need for external heat sources.

When gaseous oxygen replaces air, technical improvements almost always result. Exceptions occur in reactions where decomposition or too complete a combustion would occur. But air is not the ideal reactant, either, because of the problems associated with removing nitrogen. In these cases, oxygen diluted with a more easily separated inert would technically be better.

Naturally, in all cases, oxygen usage must be justified economically. The fields where oxygen has proved to be economically advantageous will now be considered.

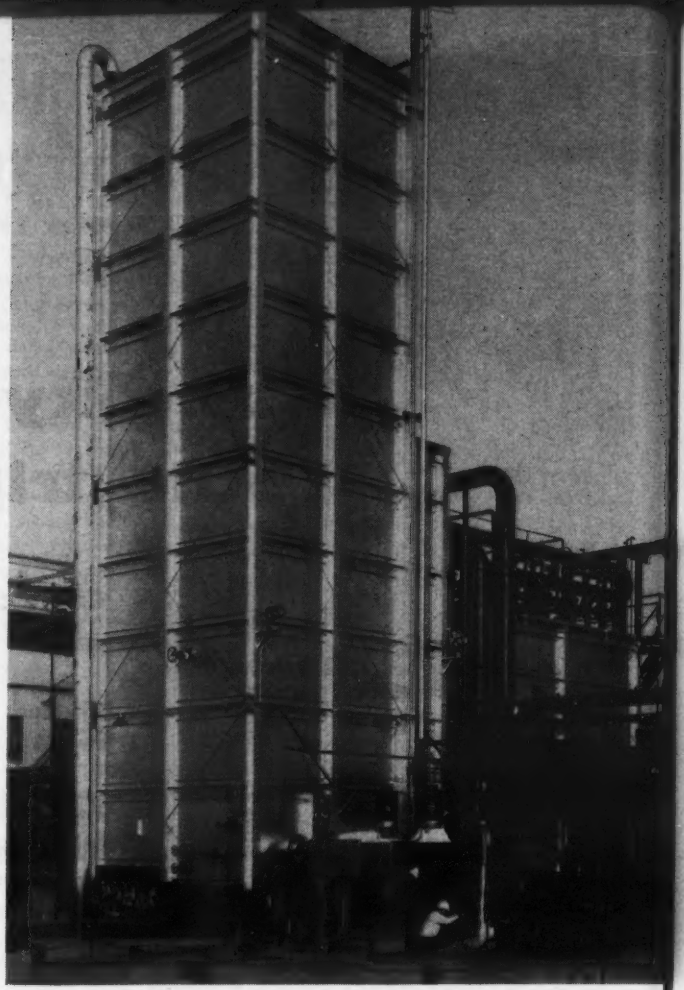
Quality of Steel Improved By Oxygen

At present the steel industry is the largest oxygen consumer, accounting for almost 45% of the total U.S. output. Most oxygen used by the steel producers goes into the steelmaking process itself. Oxygen is used to enrich the air fed to open hearths and blast furnaces, and pure oxygen is used in special steelmaking furnaces such as the L-D and Kaldo Converters. In these applications, oxygen not only increases production appreciably but also frequently improves the quality of the steel produced.

Large quantities of oxygen are also used to decrease the time required to melt scrap iron and to burn off surface imperfections from slabs and billets.

Many diverse applications account for about 15% of the oxygen market. Chief among these are medical and aviation breathing; and welding, melting, cutting, and polishing operations performed by the metalworking, glass, and lamp industries.

The chemical industry uses about 40% of the total oxygen output. In the U.S., oxygen is used in certain processes to make acetylene, methanol, ethylene oxide, ammonia, ozone, titanium dioxide, chlorine, acrolein, hydrogen peroxide, acetaldehyde, formaldehyde and a score of other oxygenated organic chemicals.



Many Chemicals Made With Oxygen in U.S.

In making ammonia, oxygen is used to obtain one of the prime raw materials — hydrogen. Here oxygen is reacted with a hydrocarbon to produce synthesis gas ($CO + H_2$). Further reaction with steam produces additional hydrogen and carbon dioxide, which is removed by MEA, caustic scrub, etc. At two U.S. plants, synthesis gas obtained in this manner is used as the raw material for making methanol.

In acetylene manufacture, oxygen reacts with part of the hydrocarbon feed to produce very high temperatures rapidly. The heat generated cracks the remaining hydrocarbon to acetylene. Often the acetylene manufacturer utilizes byproduct carbon monoxide and hydrogen to make methanol. Sometimes the carbon monoxide in the stream is used to produce hydrogen for ammonia manufacture as described in the preceding paragraph. Domestically, only natural gas is used as a source of hydrocarbon for making acetylene, but processes have been proved and are used abroad which utilize naphtha-type liquid cuts.

Ethylene oxide is made by the catalytic reaction of ethylene and oxygen under pressure. Several passes are required before the yield reaches an acceptable level. Since oxygen use greatly reduces the gas volume, smaller, less expensive equipment can be used.

At Bishop, Texas, the

◀ **Cold box** *and auxiliary equipment for 220-ton-per-day air-separation plant for production of oxygen and nitrogen at W. R. Grace Company, Memphis, Tennessee*

Celanese Corporation has a 400-ton-per-day oxygen plant used to oxidize propane and butane. Here methanol, acetaldehyde, formaldehyde and a series of other oxygenated hydrocarbons are produced. Through the use of oxygen, appreciable production increases occurred, and vent losses of propane and butane were eliminated.

The following processes account for about five percent of the total oxygen consumption in the U.S. chemical industry: Acrolein by oxidation of propylene; chlorine from nitrosyl chloride; hydrogen peroxide from isopropanol; titanium dioxide from titanium tetrachloride; and ozone from oxygen.

In Europe, especially in Russia and Germany, extensive study on oxygen usage in the chemical field has been conducted since the late '20's. Besides being utilized in many of the above processes, oxygen is used in Europe to produce acetaldehyde from ethylene, acetic acid from acetaldehyde, and to generate synthesis gas for the subsequent production of iso-octyl alcohol and the other oxo alcohols.

Most foreign oxygen production, however, has been used to generate fuels from solid hydrocarbons. Generally, oxygen and steam are reacted with low-grade coal under pressure. To produce a fairly high-Btu-value gas, this product is mixed with methane-rich gas and distributed as a fuel.

In South Africa, synthesis gas derived from oxygen and coal is converted into liquid hydrocarbons by two improved versions of the original Fischer-Tropsch synthesis. The oxygen plant is one of the world's largest, producing about 2000 tons per day. Gasoline, diesel oil, fuel oil, paraffin waxes, liquid petroleum gas, alcohols, butanes and organic acids are the principal products.

Should the spread between the cost of fluid and solid hydrocarbons continue to increase, solid hydrocarbon processes such as these will undoubtedly receive more attention in the U.S. In fact, tests on low-grade coal gasification with oxygen have already been conducted by the U.S. Bureau of Mines.

Inorganic Chemical Use Limited At Present

As seen, oxygen is principally employed in the production of organic chemicals. Oxygen is used extensively in the manufacture of one inorganic chemical, nitric acid, but so far this practice has been limited to Europe.

Oxygen also has an obvious potential in the manufacture of sulfuric acid. During World War II a 10-ton-per-day plant was run in Germany to test oxygen as a replacement for air in the catalytic oxidation of SO_2 to SO_3. The results of the German tests are not known, but Russian tests have indicated that appreciable production increases can be obtained by using oxygen in the manufacture of sulfuric acid.

At Trail, British Columbia, the Consolidated Mining and Smelting Co. uses byproduct oxygen in the manufacture of several hundred tons per day of sulfuric acid.

In Germany, extensive tests have been conducted on the use of oxygen in catalytic oxidation of hydrogen chloride to obtain chlorine; on the oxidation of ammonia to nitrous oxide; and on the reaction of lime, coke and oxygen to produce calcium carbide.

The use of oxygen in many other processes has been suggested and studied. Among these processes are the partial oxidation of ethane or propane to ethylene; the preparation of maleic anhydride from naphthalene and phenol from benzene; and the production

To next page

IN THE CRUCIAL 60's



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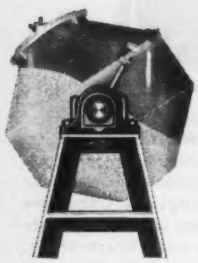
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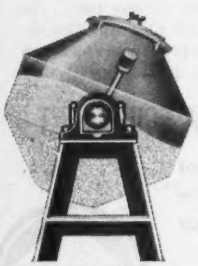
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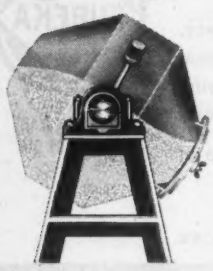




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Check 5587 opposite last page.

U.S. oxygen production could triple by 1970

From preceding page

of benzaldehyde, anthraquinone, and various perchlorates, perborates and peroxides.

Oxygen Purchased "Over The Fence"

In the steel industry, oxygen is usually purchased under an arrangement which appears to be of increasing interest to the chemical market. Steel companies generally obtain oxygen under a "purchase of gas" agreement, much as they buy water or electricity. In exchange for a contract, typically of 15 years' duration, the supplier builds an oxygen plant on or adjacent to the steel mill property. Ownership of the plant is retained by the supplier, who pipelines oxygen to the various use areas of the mill. Usually the supplier operates the plant.

Steel Makers Benefited in Several Ways

There are several advantages in this operation. The steel company is relieved of the heavy fixed investment required for the oxygen facility, which generally runs several million dollars. This money is freed for investment in other projects more closely related to the steel company's business and with more attractive payout periods. Busy steel-company management is also relieved of overseeing another operation important to its production.

Since oxygen is the supplier's prime business, a very high operating rate is assured. A fully-trained and experienced work force is provided by the oxygen manufacturer who operates the plant. When necessary, "back up" oxygen can be obtained from the supplier's own liquid plants. Similar to other chemical suppliers, oxygen suppliers offer technical service on the use of oxygen and carry on research and development programs to improve oxygen use.

In the past the chemical industry has been slow to follow this practice, generally preferring to buy its oxygen plants. In the last year, however, more interest has been shown in "gas purchase agreements." With the present squeeze on profits, this concept affords a means of appreciably increasing the chemical companies' rate of return on investment.

In addition, consideration of oxygen use in the chemical industry should not be restricted strictly to new process plants but should be extended to existing facilities. Without adding additional production equipment, steel companies have greatly increased their output, often more than 30%, by enriching their oxidation reactions with oxygen. Since they generally buy oxygen under a "gas purchase agreement," these production increases have been obtained without any additional fixed investment.

The chemical industry will greatly increase its use of oxygen. Some feel that in the next decade chemicals will replace steel as the leading oxygen-consuming industry in this country.

Improved Production Trims Price of Oxygen

In recent years, the number and size of oxygen plants installed throughout the U.S. have greatly increased. The great number of plants has resulted in appreciable declines in the heavy expense associated with distributing oxygen and the larger plants have brought about a reduction in production costs. As a result the price of oxygen has fallen considerably.

Oxygen and its companion component of the air, nitrogen, are basic chemicals finding increasing uses in many types of chemical operations. In the near future, cryogenic air-separation plants will be an integral part of nearly every major chemical area. In light of these developments, chemical management will find it increasingly advantageous to consider the use of oxygen in new and existing process plants. ■



Exhibitors *and their aides compare notes at the end of one of the hard nine-hour days in Hall 3, one of 23 halls at ACHEMA. Private conference rooms, a feature of many of the booths, paved the way for vigorous, personal business discussions*

An Ausländer* at ACHEMA

The 800 Americans visiting the 13th Chemical Engineering Exhibition-Congress in Germany had a good first-hand look at processes, equipment, instruments and materials being offered a resurgent chemical technology overseas. Standing out among the 1400 exhibits, on some 20 acres, were innovations well worth a second look by the U.S. chemical operating manager

On-the-spot report . . .

By DANA B. BERG
Executive Editor



***"Auslander"** (foreign visitor) Berg, CP exec editor, checks notes before the clubhouse many ACHEMA exhibitors and visitors from outside Germany used for informal discussion, often over a pot of coffee or a glass of world-renowned German beer*

LOOKING for a diamond in the rough can be costly, time-consuming and disheartening. But the promise of finding the perfect gem keeps the less easily discouraged prospector hard at work.

Not all of the 800 or so American visitors† of the ACHEMA Chemical Engineering Exhibition-Congress were rewarded with new "discoveries" as they doggedly plodded past 1400 booths in 23 halls and four outdoor display areas occupying over 20 acres at the Frankfurt (Main), Germany, fair grounds.

Much of the displayed European laboratory and process equipment and instrumentation, they found, was of types already well-known in the

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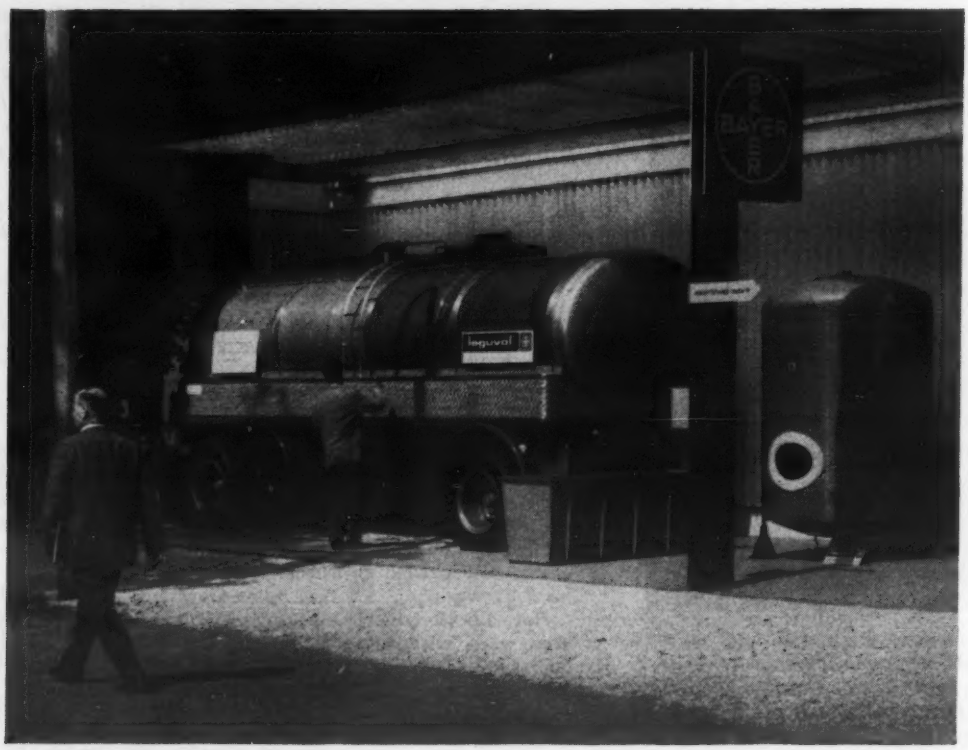
†Total attendance at the nine-day June affair exceeded 134,000.

An ausländer at ACHEMA *From preceding page*



The sun *broke through after the show's rainy opening days . . . but even the wet weather didn't harm the attendance, a record 134,266 despite the fact that much of the equipment was located outdoors in the 20 acres of display area*

Truck *with tank made from Bayer's unsaturated polyester resin, reinforced, is a good example of German work being done in this area. A railway tankcar, with close to double the capacity of the tank truck shown here, has just started rolling; it has polyester/synthetic foam sandwich construction*



U.S. (a surprising number of the foreign-developed items already being produced under license here). Some developments were obviously lagging behind what we have available here. Some were familiar U.S.-developed items looking for overseas outlets.

But it was very apparent that those Americans who dug beneath the surface and discussed specific problems with the wealth of technical personnel manning the booths found their time expenditure well worth while.

Item: Representatives of a major U.S. chemical company spent profitable hours of discussion with Hans J. Zimmer Aktiengesellschaft personnel, in connection with Zimmer's process for air oxidation of cyclohexane to cyclohexanone, as a route to caprolactam. The newly developed process boasts a yield of 90% cyclohexanone (based on cyclohexane) and a cyclohexanone purity of better than 99.8%

Item: A U.S. process-equipment manufacturer is seriously considering licensing a unique "intermittent-blast" dryer being shown by Samesreuther & Co. GmbH. Drying is achieved by introducing intermittent shots of hot air, each from a different point, into a bed of granules, crystals or powders. This prevents development of channels or voids in the bed and makes drying more efficient and uniform. Abrasion is, of course, less than in a common fluidized bed.

(The dryer, incidentally, was originally developed by Farbwerke Hoechst, and is being used by them. It is quite evident that communication between German chemical companies and German equipment and instrument manufacturers is highly developed. Many developments being displayed by the "hardware" people traced their origin to one of the larger German chemical companies.)

Item: A line of protective-coating resins produced by Saureschutz Rheinruhr GmbH caught much more than a

passing glance from the representative of a U.S. company moving rapidly in the coating field. The plastic coatings, Sakaphens, are combinations of various resins to meet specific corrosive conditions. New types, impermeable to water and its vapor, have been introduced. Others are resistant to gamma and beta rays. A number are being used on heat-exchange equipment where they prevent corrosive attack and scale build-up without seriously decreasing heat transfer.

Not all the interest shown by U.S. attendees revolved around developments that would be brought back to America for use in or merchandizing to plants here. The growing number of U.S.-owned chemical companies in Europe were represented by men looking for processsing and laboratory items which could be used in their European plants.

Price is, of course, one good reason to buy in Europe for use in Europe. Another reason: You get equipment made to European standards and specifications, familiar to plant operators who are much more often than not nationals of the country where the plant is located.

But delivery is becoming a problem in Germany, especially in the case of the more complicated equipment. And, advanced as European technology is in many areas, there are still plenty of places where American designs are preferred. All these factors, and more, must be weighed in making the purchasing decision.

'Pathfinding Aids' Helped

Finding one's way around such a mammoth, sprawling exhibition *could* have been considerably more difficult than it was. Big help was a 566-page guidebook given to each registrant at the entrance. This contained complete floor plans, an alphabetical list of exhibitors, products and their booth numbers, plus an alphabetical list of products, their manufacturers and booth numbers . . . in four languages. The book also held daily schedules of lectures, plant trips, showings of industrial and scientific films, and various social events taking place in connection with the exhibition.

The two-volume, 1262-page "European Catalog of Chemical Plant, Apparatus, Instruments" sent to registrants prior to the exhibition was also a help in planning coverage, particularly the sizable section describing in some detail the various recent developments by many European manufacturers.

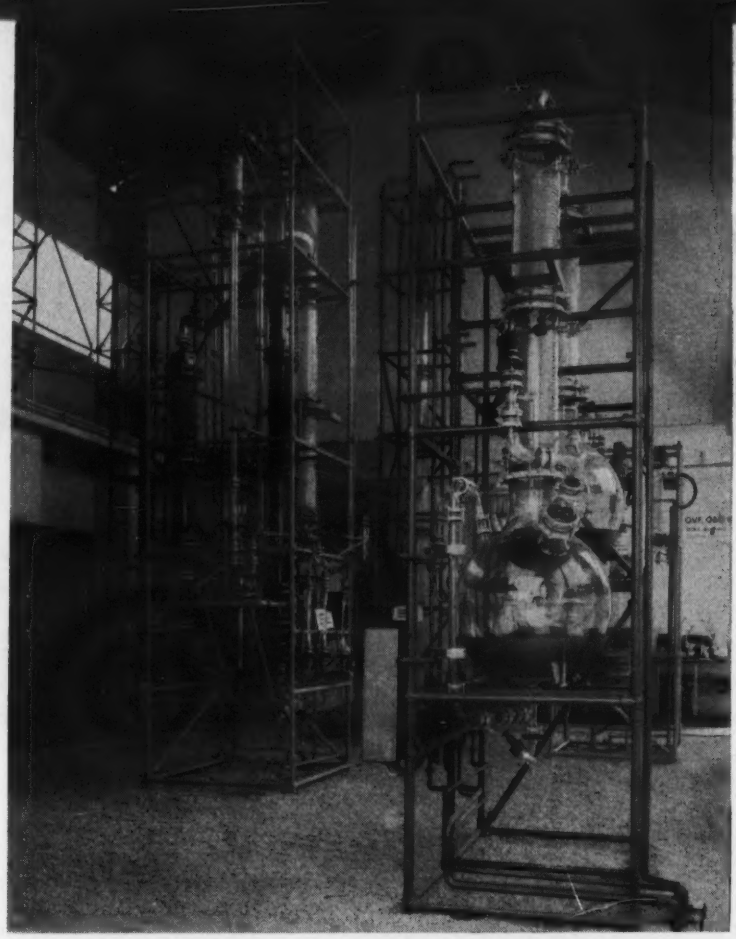
The sponsors of the affair, DECHEMA — German Association for Chemical Equipment — rightfully spoke with pride about the uniform labeling of all booths with prominent numbers that extended out at the same level into the aisles. Then too, it was clear that much effort was made to lump together exhibits dealing with similar subjects — processing equipment, process instrumentation, laboratory equipment, structural materials, etc.

There's no dodging the fact that an unfamiliarity with the German language slowed up foreign visitors in their discussions at the booths (over 1100 of the 1400 exhibiting firms were German; more than half the visitors were from other countries, although many of these were from neighboring

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U.S. Companies at ACHEMA

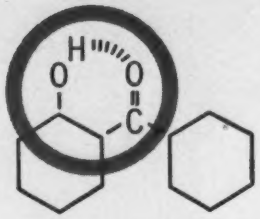
Some forty U.S.-identified companies displayed their wares at ACHEMA. CP interviewed spokesmen in their booths, probing for not only their impressions of the exposition itself but also about problems of selling to Europe in general. Look for this exclusive report next month in CHEMICAL PROCESSING.



***Large equipment** in glass was an eye-catcher in a number of booths. Such apparatus, for pilot plants and small-scale production, is used more extensively in Europe than in U.S.*

***Many visitors** took their coffee breaks on the fly in order to cover the 1400 exhibits at ACHEMA. Cigarets and cigars, too, were sold by girls circulating through the halls and outdoor areas*





Substituted *2-hydroxybenzophenone, with chelate ring indicated within shaded circle*

Don't let UV dim your product

Ultraviolet light absorbers are helping boost the service life of UV-sensitive polymers toward the 15- to 20-year requirement of the multi-billion-dollar building industry. How good are the products now available? What are the problems still to be solved and how will they bear on processing operations? Here's what has been done, where the weak spots are, and what to look for in the future



Photo courtesy American Oil Company

Sign of the times *— as wave of brand-name changes booms new sign activity. Material used here is acrylic*

THE tremendous potential market for plastics in direct-outdoor-exposure building construction is attracting increasing attention to the problem of plastics weathering phenomena. Ultraviolet (UV) is now known to play a major (but not exclusive role) in weathering, with oxygen, moisture, corrosive atmospheres and abrasive dusts adding their combined — and often synergistic-degradative effects.

Important accomplishments have been made in stabilizing plastics against UV and oxygen, a major step towards resolving the total problem of weatherability. Recent efforts have resulted in breakthroughs which may go far in resolving the biggest problem of all: how to know whether the modern, most highly developed plastics will stand up for 10 or 20 years of outdoor exposure — without having to wait almost that long before finding out.

It was only seven years ago that the plastics industry began commercial use of a new highly efficient form of UV protective agent which could be dissolved or dispersed in the plastic itself. Since then, the use of such material has grown rapidly to the point where 1960 sales for all UV absorbers used in plastics is believed to have exceeded $2 million.

This type of protective agent is best illustrated by the 2-hydroxybenzophenone family, derivatives of which have proliferated to the point where, with a few other types, there are now commercially available UV absorbers suitable for most plastics compounding needs.

The benzophenones have a unique combination of properties which enable them to absorb strongly the 320-400 millimicron ($m\mu$) wavelength region — which is most damaging to organic materials — and in doing this remain reasonably stable both to degradation by UV and within the plastics composition itself. Another class of absorbers of more limited spectral absorb-



Eastman scientists *with some of the molecular "sleuthing" apparatus used in recent breakthrough studies on plastics degradation. Left to right are Gordon Newland, Dr. Wilson Patton, Dr. John Tamblyn*

future

By **JOHN B. MELLECKER,**
Editor — New York

ence (below 320 mμ) are the older salicylates, which have found broad usefulness.

How Absorbers Work

All UV absorbers function by means of collecting and converting UV light energy into forms which will not harm otherwise sensitive organic materials. The benzophenone-type absorbers are particularly effective because they have as a central working feature a "chelate" ring structure as shown in Fig 1.

This is an unusual ring in that it has an open (but "charged") space across which a hydrogen atom oscillates between its normal hydroxyl position and a ring-adjacent oxygen atom, performing in this manner when energized by a photon of UV light. As the chelate ring goes into such resonance it begins to convert its absorbed energy into other forms such as heat, emission of visible light such as by fluoresence, or by shifting to an isomeric form from which it may return during darkness.

Solubility stableness of the absorber in plastics compositions is achieved (as in the case of the benzophenones, for example) by making the molecular structure surrounding the chelate ring as physically attractive as possible to the plastics composition. If the plastic is primarily of long-chain structure, then the surrounding structure of the benzophenones may be modified by attachment of side chains at the "R" position as shown in Fig 1, and by other structural changes of more sophisticated nature.

Modification of that part of the molecule closest to the chelate ring itself is done to alter absorbency characteristics, usually to try to make them particularly effective in the region most damaging to the specific polymer to be protected, yet cutting off absorbency at the higher wavelength region to minimize absorption of visible blue, a quality which tends to impart yellowness to the plastic.

Old Rules Need Review

The practical art of incorporating UV absorbers into plastics has been developed with such skill that no longer is it safe to follow old rules as to which plastic types will and will not stand up well in exposure to strong light or outdoor weather. Through such treatment, other plastics may be said to be acquiring or approaching the stability long attributed to acrylics . . . but even acrylics can be helped by use of modern UV absorbers.

Examples of improvements include: A stabilized polyester film (Du pont's Mylar) being marketed for greenhouse glazing with a five-year guarantee; stabilized polystyrenes finding wide use in fluorescent lighting diffusers (where UV exposure may be quite severe); polyesters in boat construction, made practical by a "gel coating"-technique which permits concentration of resin, stabilized by heavy pigmentation and use of UV absorbers, at outer exposed surfaces.

Convertible-top rear windows, long subject to serious discoloration, are now being produced of UV-stabilized vinyl for all but one American automobile manufacturer.

The list of improved plastics could go on and on, confirming the impact UV stabilization has had on extending the usefulness of product after product. Much evidence indicates that these improvements may be, in the case of some materials, capable of providing the 10 or 20 years of outdoor serviceability expected by architects and builders.

Two Big Problems Still Need Solving

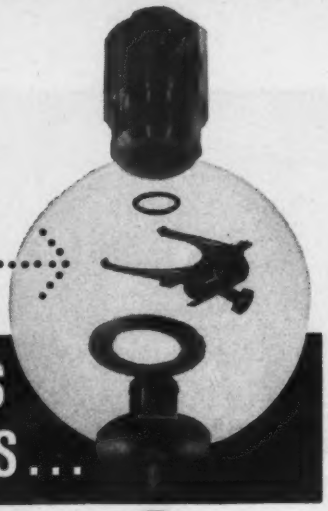
Two major problems confront industry in proving this serviceability. One of these is the need for reliable, widely used and accepted tests to predict outdoor weather exposure performance accurately. The second is the need for means to communicate assurances of product service performance to the using groups. This must be done in such a manner as not to acquire disclosure of composition details which would permit competitors to derive undue benefit from the material supplier's innovation investment.

CHEMICAL PROCESSING has found much interest and activity among plastics materials producers towards improved, comparable outdoor testing. Less success is reported in accelerated indoor physical tests that duplicate physical results of longer outdoor exposure.

Most people are of the opin-

To next page

With this new Varea-meter external clamp



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One big benefit you get from Wallace & Tiernan's new Varea-meter line is dependable tube clamping. Tubes can't vibrate loose; can't be dislodged, even by sudden flow surges.

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Check 5588 opposite last page.

Don't let UV dim your product future

From preceding page

ion that only with better understanding of the weathering phenomenon itself, with respect to the plastics composition, will it be possible to predict in the laboratory with certainty what will happen upon outdoor exposure.

If extremely sensitive detections could be made of chemical changes which take place in plastics exposed to the same wavelengths indoors and outdoors — and if these changes could be understood in terms of plastics structure — then the evaluation problem would be put on a different plane. Giant strides over today's evaluation bottlenecks could thus be made.

Meeting the Challenge Of Test Reliability

Within the last few months, much knowledge and technique has been developed along these lines by groups working in at least three commercial laboratories. All these laboratories are equipped with the most advanced devices for detecting and analyzing changes in molecular state. Putting these new techniques into practice may soon make possible translation of findings for certain classes of polymers into predictions for outdoor performance of the dry type experienced in Arizona.

Although still far from simulating the total weathering process, which includes the combined effects of UV, moisture and other degradative factors, the current approach which combines UV with the oxygen of air represents a stride which has industry scientists optimistic of changing the art of stabilization into an exact, fundamentally-based science.

Cyanamid scientists, for example, have split sunlight into its spectrum[1], projected this onto plastics surfaces and measured gross chemical change as related to wavebands in the 300-400 $m\mu$ UV range. From this were determined "activation spectra" — UV wavelengths for each polymer which are the most dam-

To page 86

Current literature available from leading manufacturers of ultraviolet light absorbers

American Cyanamid Co., Organic Chemicals Div. — "Plastics Additives" booklet summarizes technical and commercial information.
Check 5589 opposite last page.

Antara Chemicals Div., General Aniline & Film Corp. — "Uvinul Ultraviolet Absorbers" presents both new and established uses in 12-page Bul.
Check 5590 opposite last page.

Dow Chemical Company — "Light Absorbers" tells the how and why in 16 pages with illustrations.
Check 5591 opposite last page.

Eastman Chemical Products, Inc., Chemicals Div., Subsidiary of Eastman Kodak Co. — "Inhibitors DOBP, DHBP" technical data sheets include exposure test results.
Check 5592 opposite last page.

Ferro Chemical Div., Ferro Corp. — Data sheets "Permyl B-100", "AM-101" list properties, uses and test data.
Check 5593 opposite last page.

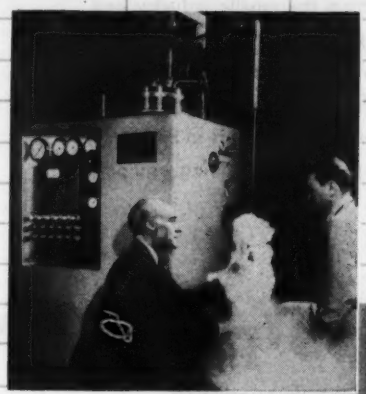
Geigy Industrial Chemicals Div., Geigy Chemical Corp. — Formulations, test data and graphs are in files "Tinuvin P" and "Tinuvin 326."
Check 5594 opposite last page.

Koppers Company, Inc., Chemicals & Dyestuffs Div. — Bulletin K-2257 highlights ultraviolet absorbing properties of 4-acetylresorcinol.
Check 5595 opposite last page.

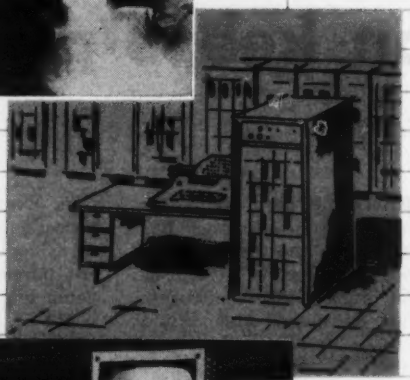
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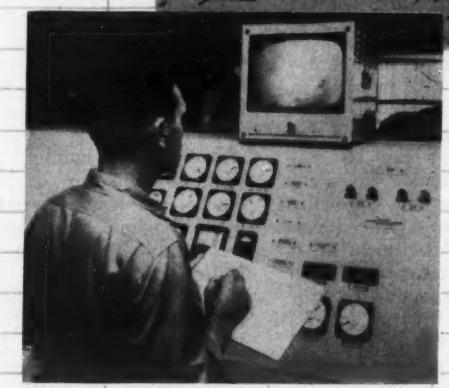
Process Instrumentation and Control



1



4



5

...spotlighting in 32 pages the latest developments in this fast-moving field, including case histories, new products, technical literature, and these five-special trend-probing pieces:

1 CRYOGENIC INSTRUMENTATION

Simple jobs become tough below −135°F 36

2 MEASURING MASS FLOW

Welter of new devices do it directly 42

3 INSTRUMENT-MAINTENANCE TRAINING

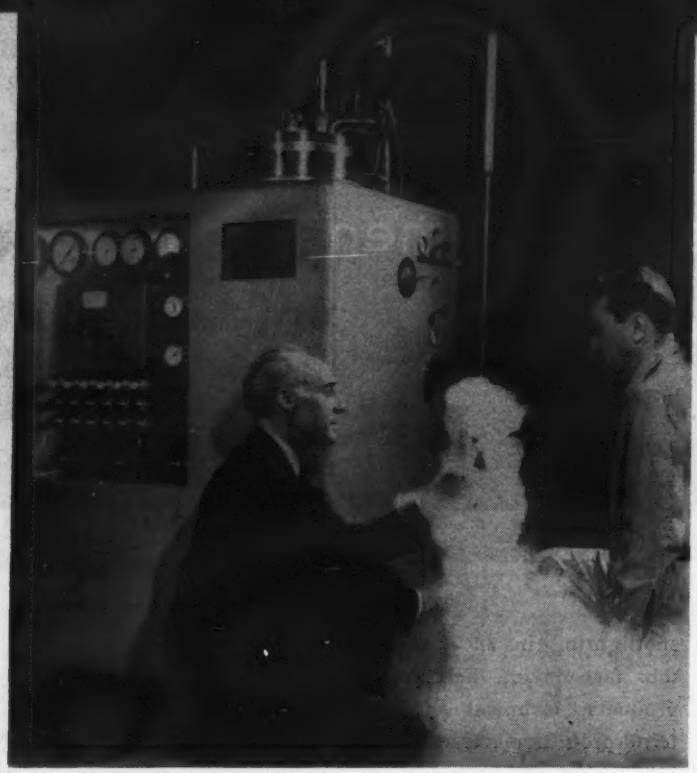
Skilled men are made, not born 50

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***Liquid helium** at −452°F flows from Cryostat, a device made by Arthur D. Little, Inc. for low-temperature engineering and research. The Foxboro Class III dial thermometers on unit utilize helium gas pressure. They have a high degree of accuracy and reproducibility*

CPI plants employing industrial cryogenics have picked up many instrumentation ideas from the missile industry and adapted them to their own specific uses. Here, two authorities in the field give a concise, up-to-date report on the installation and use of low-temperature instruments, along with a wrap-up on latest developments in liquid-level devices, pressure gages, temperature-measuring equipment, flowmeters and other units

Cryogenic instrumentation keeps pace with

ARTHUR D. FOWLE is leader of the Cryogenics and Fluid Mechanics Group, Arthur D. Little, Inc., Cambridge, Mass. In this work he has made noteworthy contributions to the application of cryogenic engineering. Mr. Fowle was graduated from Massachusetts Institute of Technology with a BS and MS in mechanical engineering.

Formerly assistant professor in mechanical engineering at MIT, he was also previously associated with the Ultrasonic Corporation, Cambridge, Mass., and with the Gas Turbine Department of Ford Motor Company, Dearborn, Michigan



WILLIAM G. PESTALOZZI is located at Vandenberg Air Force Base, Santa Maria, California, where — as an employee of Arthur D. Little, Inc. — he is coordinating the instrumentation effort for the Titan ICBM propellant-loading system, which utilizes cryogenic liquid propellant. He is also pursuing several "state of the art" studies in cryogenic instrumentation.

Previously with the Cryogenic Engineering Laboratory, National Bureau of Standards, Boulder, Colorado, Mr. Pestalozzi specialized in cryogenic instrumentation for applied and basic research experiments. He was graduated from the University of Colorado with a BS degree in electrical engineering



DURING the past few years such an enormous increase has occurred in the handling of cryogenic materials — such as liquid oxygen, liquid nitrogen, liquid hydrogen and liquid helium — that there has been a greatly increased demand for instruments capable of operating accurately and reliably in the cryogenic range. In some cases, equipment suitable for other conditions can be utilized for cryogenics by slight modification or by following certain designated procedures. In other instances, however, it has been necessary to design instruments specifically for cryogenic use.

In all cases, the selection of a satisfactory measurement system requires familiarity with the limitations in accuracy, the special design modifications and installation requirements imposed by the cryogenic conditions.

The heat capacity of the instrument is an important consideration in cryogenic design. Every time a cryogenic processing unit or storage vessel is cooled down from ambient temperature to the cryogenic temperature of −300 or −400°F, a costly quantity of the cryogenic fluid must be vaporized just to cool down the equipment. The problem becomes more acute with intermittent processes or when handling liquids with extremely low boiling points, such as hydrogen or helium. Hence, the less material used in a cryogenic instrument, the less costly will be these vaporization losses.

Another problem has been encountered when instrument lines are used for remote measurement of pressure, in order to remove the meter from the deleterious effect of a cryogenic environment. In such installations oscillations of the indicator system are often produced by a shifting liquid-to-gas interface within the pressure transfer line and result in uncertainties in the

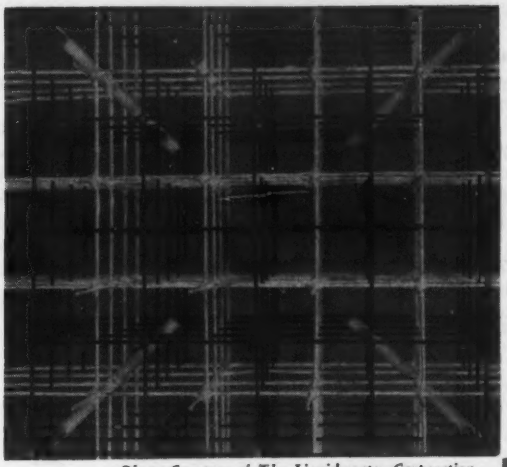


Photo Courtesy of The Liquidometer Corporation

Recently developed *capacitance gage consists of two electrically independent lattices or matrices constructed within the tank to form an interwoven network. This type of gage gives an accurate measurement of liquid level for any shape of tank in any position*

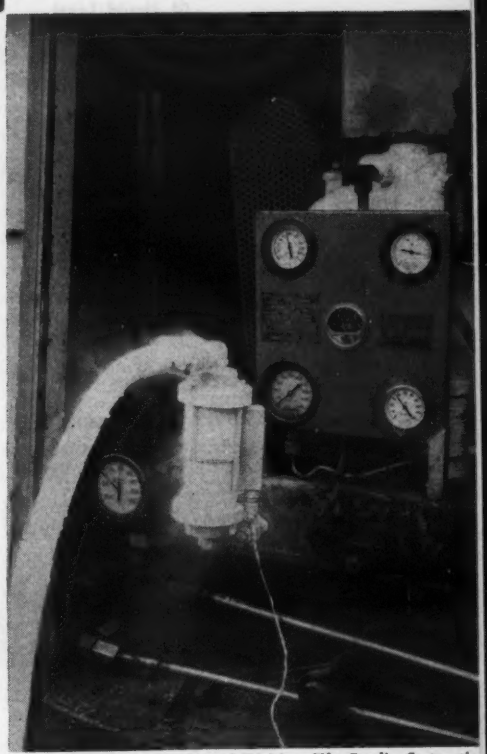


Photo Courtesy Pioneer Control Division, The Bendix Corporation

Flowmeter, *under test with liquid oxygen, measures flow rate by change in angular momentum of fluid stream*

booming field

By ARTHUR A. FOWLE and WILLIAM G. PESTALOZZI

measurement of the pressure.

Successful methods of locating and confining the interface include the installation of a heat source or the use of vertical loops in the sensing line. In some applications the pressure oscillations have been damped by the use of an empirically-determined surge chamber in the sensing line. Continuous purging of instrument lines with a small flow of helium gas has also been used successfully.

Insulated seals are used to bring electric leads through a cryogenic pipe or vessel wall. To eliminate condensation at the seal, a long stainless steel tube is welded to that portion of the transfer line or tank wall containing the penetration for the wire and the seal is placed at its far end. "Warm," and, therefore, dry contacts are provided since the cryogenic fluid will not penetrate the termination of the dead-ended tube system.

Special caution is required in the measurement of cryogenic temperatures by thermocouples. When wall temperatures are measured, care should be taken to minimize heat conduction down the wires to the measuring couple. Since the temperature gradients at a wall are often extremely high the measuring element must be securely attached (peaned or welded).

When liquid temperatures are measured, fittings, sheaths, stillwells and shields should not be in contact with the sensing element since these accessories act as heat conductors and erroneous readings may result.

Due to the difficulty of predicting the exact volume of liquid in a cryogenic tank at any one level, adjustable mountings are provided for point liquid sensors. During calibration with the cryogenic fluid, the sensors may then be positioned at the desired level.

Materials for low-temperature applications should be selected on the basis of their structural properties — ie, yield, tensile strength, ductility, impact strength and notch sensitivity. They must also be metallurgically stable, so that phase changes in the crystalline structure will not occur either with time or under repeated thermal cycling. Low heat conductivity, low heat capacity, low coefficient of thermal expansion and low emissivity are properties that can be used to good advantage.

In general, cryogenic instruments are constructed of austenitic stainless steel, or nonferrous metals. Certain plastics and ceramics also have special uses. Impact sensitivity of the construction material is important when liquid oxygen is to be handled. Instruments for use with liquid fluorine must be made of materials chosen to resist its corrosive effects. Care must be exercised in the selection, but cryogenic instrumentation has not

To next page

Cryogenic instrumentation keeps pace *From preceding page*

been seriously hampered by lack of suitable construction materials.

Cryogenic instrumentation has been used for gas-liquefaction facilities, transport dewars, storage vessels, gas separation plants, oxygen breathing apparatus, propellant loading systems, missiles and aircraft, and research equipment.

Principal types of cryogenic instruments are liquid level devices, pressure sensors, temperature measuring units and flow meters. Each will be discussed in turn.

Continuous Measurement Of Liquid Level

Probably the greatest effort in the field of cryogenic instrumentation has been directed towards the development of liquid level devices. These are divided into two types: those that make continuous measurements, and those that make point measurements.



Photo Courtesy Minneapolis-Honeywell Regulator Company

Capacitance *liquid-level probe with coaxial capacitor*

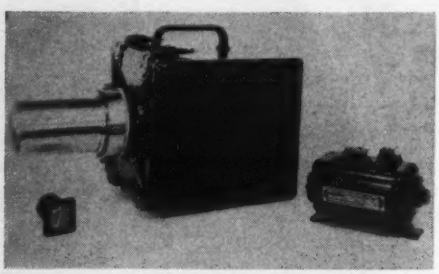


Photo Courtesy Servomechanisms, Inc.

Differential-pressure *transducer and liquid-oxygen tanking computer system*

The most common of the continuous measuring devices is the differential-pressure liquid-level gage. For a correct interpretation of a differential-pressure measurement in a cryogenic system, it is important to know the location of the liquid-to-gas interface, as discussed earlier. With a proper arrangement, both instrument lines are filled with gas, and, thus, the pressure at the bottom tap is proportional to liquid head plus ullage pressure regardless of transducer location.

Basic simplicity and ease of maintenance are the major advantages of a differential-pressure gaging system. Maintenance is facilitated because all components are outside the tank.

Any differential-pressure transducer must be calibrated to indicate a true measure of liquid level. Gages of this type are employed to monitor liquid storage tank level in both the Titan and Atlas Propellant Loading Systems and to control liquid-oxygen tanking for the Jupiter missile.

Capacitance liquid level gages have been used extensively in road transport dewars and facility storage tanks. Available probes for this type of gage include the coaxial capacitor and the interleaved capacitor.

A unique type of capacitance gage was recently developed by one manufacturer. Two electrically independent lattices or matrices are constructed within the tank to form an interwoven network. By decreasing the distance between the matrix wires, practically any desired resolution can be obtained. This type of capacitance gaging gives accurate measurements of liquid level for all shapes of tanks in any position.

Ultrasonic liquid level gages have been successfully used in croygenic tank trucks and are in operation at various test stands. An attempt to use such a system in one of the ICBM programs was discontinued because the associated electronic circuitry was not sufficiently reliable.

A decided advantage of an ultrasonic gaging system is that its accuracy is not affected by the vapor above the liquid surface. Errors due to variations in sonic velocity of the liquid (a function of temperature) are reduced by comparing the transit time with the time required for a sonic pulse to go a known distance in the tank. Errors or instability are introduced if the liquid interface is so agitated that the reflected sonic pulse is too weak to be picked up by the transducer. Also, violent boiling of the liquid will produce false reflections.

Point Sensors Indicate Level

Quite often only discrete vessel levels such as "full," "half full" and "empty" are required. Point sensors provide simple and reliable means for such measurements. Point sensors are also used to indicate the end of the cooldown phase of a transfer operation by disclosing the presence of liquid in a transfer line. A variety of sensors which use different principles of operation can distinguish between cryogenic liquids and vapors.

Float switches have performed satisfactorily in liquid-oxygen and liquid-nitrogen service; however, early models exhibited some tendency to freeze or hang up.

Capacitance point sensors operating on the same principle as the continuous probes have found wide acceptance in propellant loading systems. The sensing units are built to withstand shock and high flow velocities.

The difference in the refractive index between liquids and gases is utilized by an optical probe to indicate the presence or absence of a cryogenic liquid. This device is sensitive enough so that foams, liquid films and vapor mixtures do not cause a false actuation.

Ultrasonic liquid-level point sensors also are being used in cryogenic applications. These consist of a piezoelectric sensing element and associated control circuitry, and function essentially as a crystal oscillator.

Temperature-sensing elements are often used as point sensors. Since temperature changes from the vapor state to the liquid state in the vicinity of the liquid surface are not discontinuous, a direct approach yields unsatisfactory results. Rather, the accepted approach is to electrically heat such devices as the platinum wire probe, thermistor or carbon resistor.

Since at a given temperature the cooling effect of a cryogenic liquid is considerably higher than that of its vapor, the temperature of the probe drops sharply as liquid contact is made. Depending upon the resistance coefficient of the sensing element material, an increase or a decrease in current through the sensor results.

Since most of these temperature point sensors are homemade, it must be pointed out that mass or cooldown weight plays a significant role in the response of these instruments to a changing liquid level. A small mass contributes to fast response and hence greater accuracy when measuring a rapidly varying level.

Pressure Sensor Must Be Isolated

Pressure in croygenic systems is measured in the same way as in more conventional fluid systems. The pressure sensor is coupled to the cold system by a tube long enough to protect it from the damaging effects of low temperature. Thus isolated, any of the common sensing devices can be employed, but one must recognize that their indication can be influenced by this couping. For instance, gage oscillation caused by boiling in the connecting tubing can mask the measurement of small pressure differentials.

Although a number of transducers can withstand the effects of temperatures down to −320°F, for good accuracy these transducers must be calibrated at the expected operating temperature in spite of built-in compensating networks.

Since accurate evaluation of pressure transients accom-

panying the operation of cryogenic systems is often required, means for measuring dynamic pressures are needed. The transducers devised for the purpose are numerous; they fall into three general categories according to the electrical parameter upon which they operate.

One class utilizes a variation in inductance in a differential-transformer hookup. The second and third classes are based on variations in capacitance and resistance, respectively.



Photo Courtesy Trans-Sonics, Inc.

Ultrasonic *liquid-level sensor*

Of the three classes, the variable-resistance devices employing the principle of the wire strain gage provide the most versatility in physical design and require relatively simple electrical circuitry.

Consider Thermocouples For Low Temperatures

The common purpose of temperature measurement in cryogenic systems is to monitor and control the flow process. Special applications include: measurement of the degree of subcooling of the fluid upstream of an orifice or a venturi meter to establish the reliability of flow indication; and measurement to determine heat leakage to a cryogenic transfer line. In industrial applications temperatures are commonly measured with thermocouples, thermistors or resistance-wire thermometers.

Two thermocouples currently used for the measurement of cryogenic temperatures are the copper-constantan and gold-cobalt versus gold-silver combinations with sensitivities at 20°K of 5 μv/°K and 16 μv/°K respectively.

In spite of its physical simplicity, the thermocouple requires a special installation technique if satisfactory performance is to be achieved. To reduce the influence of inhomogeneities in conductors and variations between different spools of wire, a reference junction close to the range of temperatures to be measured should be chosen. The use of liquid nitrogen as a reference bath is a common practice.

Sensitivity Advantage Of Thermistors

Contrary to conventional resistance elements, thermistors exhibit a high temperature sensitivity and thus, are potentially important as sensors for the quantitative measurement of temperature. Unfortunately, however, their inverse resistance characteristic increases exponentially with decreasing temperature. With average thermistors this leads to prohibitively large values of resistance in the lower cryogenic range of temperatures.

Recently, considerable progress has been made in the development of thermistor materials more suitable for low-temperature thermometry. However, because of their extreme nonlinearity, any particular unit will be a limited-range device.

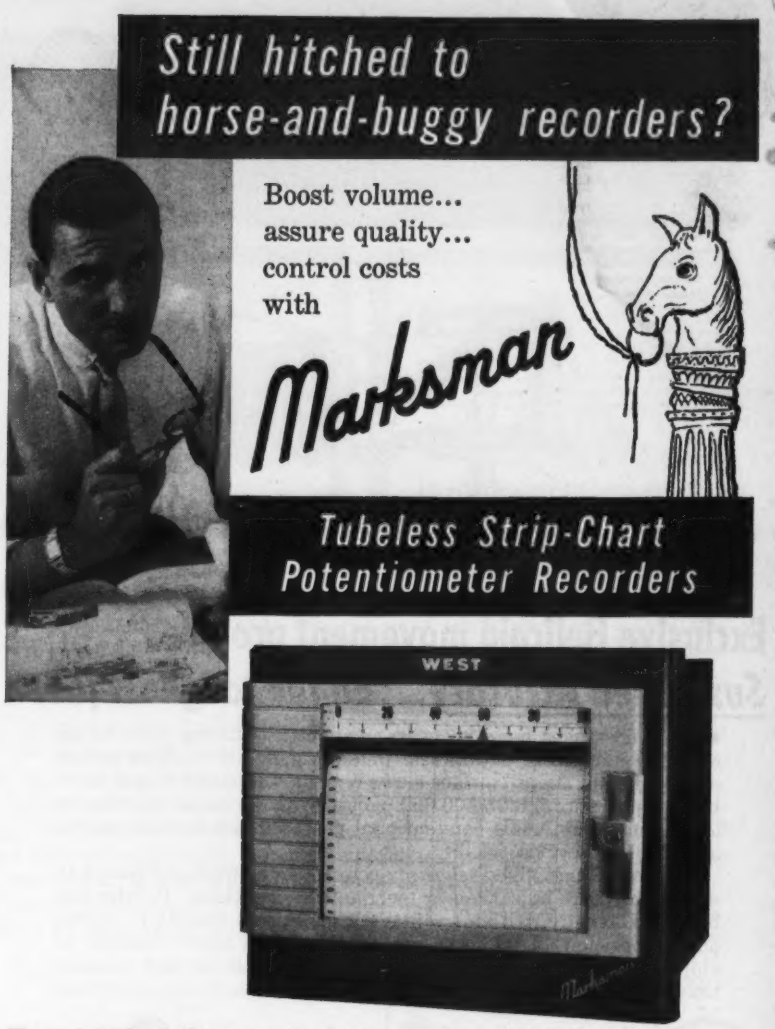
Platinum Wire Measures Temperature

At ordinary temperatures, pure metals exhibit a resistivity that is approximately proportional to the absolute temperature. This temperature dependence varies in degree from metal to metal and is adversely affected by impurities. At decreasing cryogenic temperatures, however, the sensitivity, when defined as the differential change of resistance with temperature, decreases.

Some metals, like platinum, however, remain sufficiently sensitive (and are satisfactory in other respects) to be used for thermometry at the 10 to 30°K level.

In contrast with thermistor devices, the accuracy problem here lies in the precision measurement of very low values of

To next page



Transistorized, these precise instruments avoid *all* the notorious tube-troubles. Needing no warm-up, adjustment, replacement of tubes or repair of their circuitry, Marksman recorders permit immediate and *continuous* operation...so increase production.

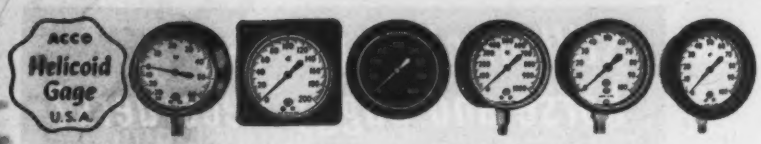
Accurate within 1/5th of 1%, they also include several special features which provide for more user-convenience and consistent quality-control. Users in many lines report Marksman recorders involve less operational cost, as well as reducing waste of other factors.

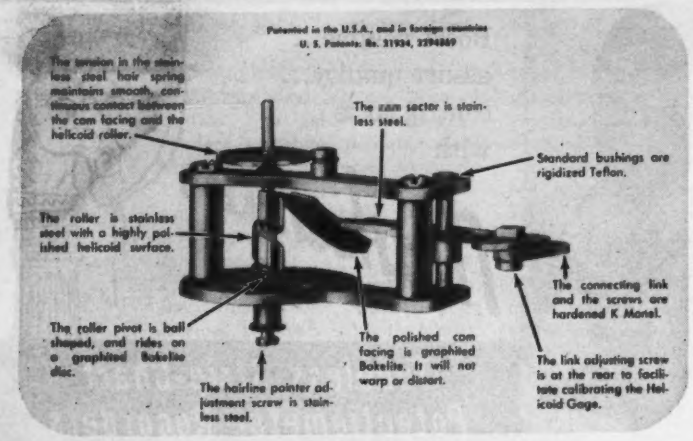
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Cryogenic instrumentation *From page 39*

resistance. Their lower limit of usefulness is controlled by the decrease in their sensitivity or by transition to the super-conducting state, depending upon the particular metal.

Cryogenic Flow Rate Hard To Measure

The fact that significant variations in fluid density may occur and that two-phase mixtures may be present in cryogenic liquid flow systems makes the measurement of cryogenic flow rate somewhat more difficult than similar measurements of less compressible and less volatile fluids.

In a cryogenic liquid transfer operation involving a batch process, the necessary flow control and metering of the amount transferred is usually accomplished by continuously monitoring the fluid quantity within the transfer vessel or receiving tank. However, a limited demand for cryogenic volume and mass flowmeters has encouraged several manufacturers to develop new flowmeter designs.

Turbine Meters Are Popular

The turbine-type mass flowmeters, which use the angular momentum principle, have been by far the most popular. (See article, page 42.) These meters have had extensive use in monitoring the performance characteristics of cryogenic pumps and rocket engines. To prevent them from being overspeeded by high velocity gas flow during cooldown, turbine flowmeters should be submerged within the storage vessel, or provisions for a bypass in the transfer line should be made. As an alternate, one manufacturer's unit provides a magnetic brake for this purpose.

A further development of the turbine flowmeter is the twin-turbine design. The turbine shafts are coupled by a torque tube, and each turbine is equipped with an Alnico magnet for position detection. Preliminary reports from users of this have indicated highly satisfactory performance in cryogenic applications.

Other developments of the turbine-type flowmeter incorporate arrangements whereby the indicated output is responsive directly to mass flow rate. The design of these units is based on the angular momentum principle which relates the applied torque to the resulting change in angular momentum of a flowing fluid (as an illustration of the principles involved, see article on flowmeters, page 42).

A great deal of ingenuity is expressed in the design of these so called "mass" flowmeters and substantial variations exist. A few have been modified to fit them for cryogenic service. Preliminary reports from field users state highly satisfactory performance.

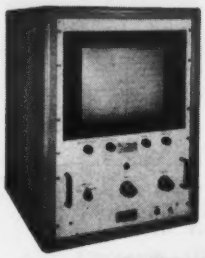
Orifice Meter Easy To Install

Cryogenic flow measurement with conventional orifices, Venturi meters and Pitot tubes has also been successfully accomplished. The simple type orifice meter is economical, easy to install and replace and is moderately accurate for single-phase flow systems. Further, it may be used for gases as well as liquids, although it must, of course, be recalibrated for application to different fluids. Its primary disadvantage is the introduction of a stagnation pressure drop which may be appreciable at high flow rates, and its sensitivity (which depends upon the magnitude of the static pressure drop) is limited. The linear range is also rather small, because of the change in discharge coefficient with flow rate.

Venturi Can Measure High Flow Rate

The Venturi flow meter eliminates some of the disadvantages of the orifice. The stagnation pressure loss is less

ATL PROFILE MONITOR

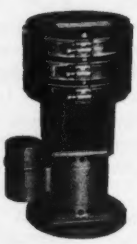


Bar-graph display of pressure, temperature, velocity, and other variables on 17" CRT. Scans up to 48 channels, each 20 times per second. Alarm functions when set point is exceeded.

ATL DELTASWITCH

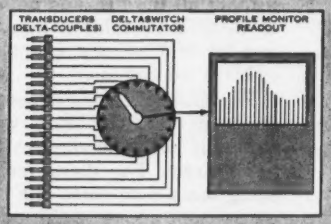
HIGH SPEED MERCURY JET COMMUTATOR

Provides high sampling rates and long, trouble-free operation. Uses mercury jet in place of conventional wiper arm. Models available with 64, 81, or 100 channels per pole, single or multiple poles, for 1200 or 1800 rpm operation.



TYPICAL SYSTEM

Illustrated below is a system combining ATL thermocouples, Deltaswitch, and Profile Monitor to display temperature gradients along a surface or at various depths in a heat shield.



For detailed information write:

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than that developed by the orifice and, therefore, the venturi meter may be used for much higher flow rates. In addition, it has a more extended linear range of operation.

The ordinary Pitot tube can be used in the conventional way to measure the flow velocity in a single-phase stream of cryogenic fluid. Mass flow can be derived from further knowledge of the characteristics of the stream.

Most flow metering devices are responsive to volumetric flow rate and variations in density during flow measurement, due to temperature change or due to fluid compressibility, must be compensated for in calculating the mass flow rate. Temperature measurement is often considered sufficient for such compensation, although more complicated devices have been used. ■

Extra 0°C test scales keep thermometers honest

Uses: Freezing- or boiling-point determinations.

Features: Thermometers are calibrated in 1/100°C divisions, and each have auxiliary scale at 0°C.

Description: Calorimeter thermometers have scale ranges of −11 to +110°C. Auxiliary scale at 0°C permits check at fixed triple point of water to correct instrument for any variations due to conditions of use.

(Calorimeter thermometers are specified in Cat 620—Brooklyn Thermometer Company Inc., 217-11 Merrick Blvd., Springfield Gardens 13, N.Y.)

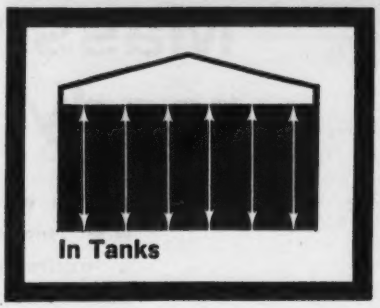
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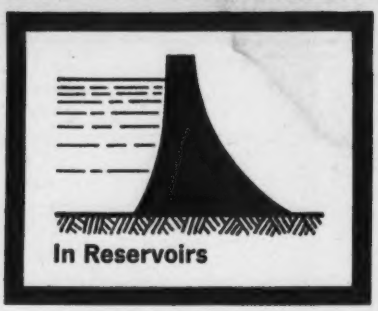
CORRECTION NOTICE

In the article on the Fischer & Porter Company's in-line blending systems on p. 102 of the June CP, accuracy was mistakenly stated to be ±5% of reading of each stream. Accuracy is actually ± 0.5% of reading of each stream.

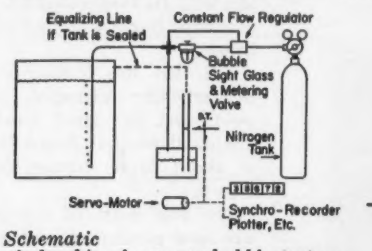
A significant new announcement...

Precision Measurement of Any Liquid

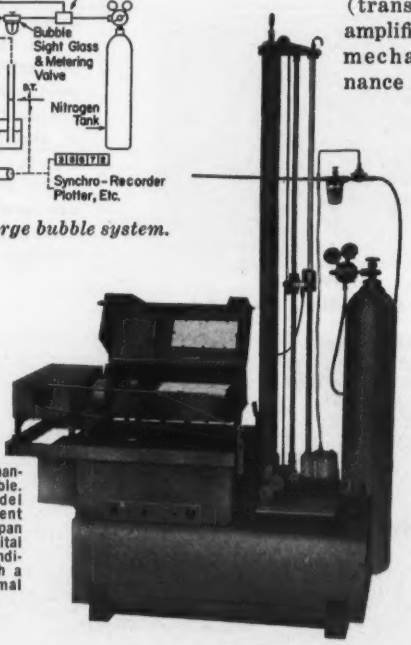




■ This technique has proven to be of remarkable accuracy, utility and reliability—with any liquid; water, high-temperature products, petroleum derivatives, radio-active materials, the most active chemicals and molten metals. ■ Combination of the Exactel Servomanometer with the purge bubbler principle is resolving problem measurement situations. The technique is relatively new but thoroughly proven over the past three years. The process is one of weighing, rather than sensing surface level. Errors caused by temperature change, absorbed gases, etc., are eliminated. For this purpose the Servomanometers generally employ 32" or 60" Hg range, but other liquids or other ranges may be used. ■ The instrument's accuracies are such that systems now in use have been readily approved for billing purposes; so accurate, in fact, as to practically defy calibration. ■ The systems are simple, reliable and economical. Except for minor lubrication and tube-cistern cleaning at approximately annual intervals, Exactel Tank Gaging systems are expected to provide **70 to 100 thousand hours of service** with no electronic (transistorized servo-amplifiers are used) or mechanical maintenance in this service.



Schematic of plumbing for purge bubble system.



Several alternate data handling options are available. Illustrated is 60" Model 1560IN-D for measurement of tank level with multispan mechanical recorder, digital encoder and counter to indicate level directly with a least unit to five decimal places.

EXACTEL INSTRUMENT COMPANY

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Check 5600 opposite last page.

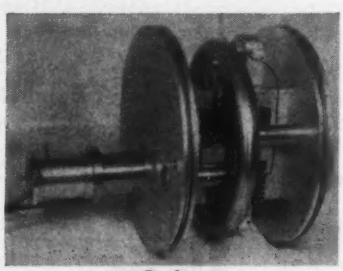
Process Instrumentation and Control

Mass flowmeters... ready to orbit in the CPI

With a quick nod of thanks to the space-age instrument men who made it all possible, CPI operating management is excitedly looking over the hottest process-measurement development to come along in many a year—the mass flowmeter

By **GEORGE BANGS,** Assistant Editor

WHETHER or not the U.S. space program succeeds in accomplishing President Kennedy's goal of beating the Russians to the moon remains to be seen. One thing is certain, however: Either way the CPI will come out a sure winner by continuing to capitalize on the spectacular achievements of space technology. The mass flowmeter is the latest and perhaps the most valuable case in point.



Decker
General Electric-Black, Sivalls & Bryson



Direct measurement of mass flow is a long-time dream of chemical-industry instrument men, but until recently dreaming was all they could do. The practical hardware just wasn't there.

All this has suddenly and dramatically changed, however, and the staid world of chemical-process flowmetering is about to be turned topsy-turvy.

No less than 22 companies are now producing and/or developing mass-flowmetering hardware. Three-fourths of these concerns have come into the field in the last three years, and none of them could sell you a device to measure mass flow prior to 1952. For the most part they have grown healthy on a diet of space business, and a majority of them are now training their guns on the CPI.

In this effort, the mass-flowmeter makers are not finding the sales resistance too tough. In the very near future they may well be able to sit back and take orders. At least a dozen chemical companies are testing and evaluating the devices. A few have incorporated mass flowmeters as permanent members of their respective instrumentation families. Many more are on the brink of making the mass-flowmeter plunge.

CPI experiences to-date with mass flowmeters give every indication of complete success in a variety of applications . . . ranging from ethylene gas to ore slurries. Enthusiasm is riding high.

However, no one is yet talking for publication. In fact many owners of mass flowmeters won't even own-up to having one. Those companies who will at least admit they are looking one over include Ethyl Corporation, Dow, International Minerals & Chemicals and Du Pont.

This excitement over mass flowmeters is easy to understand. Mass-flow rate is what the chemical engineer is really after when he measures and calculates process conditions. Mass is a basic and unvarying measure of amount. Therefore, any device which gives mass-flow rate is telling the unvarnished truth about how much material is moving through a pipe every minute.

Volumetric flow rate, on the other hand, is a pretty useless animal by itself. Before it can have any real meaning or calculation value, it must be corrected for pressure, viscosity, temperature, etc, etc, etc. Therein lies the great attraction the mass flowmeter has for the CPI. What would be nicer than to obtain the value really wanted in the first place without all the fuss and bother of devices to compensate for various and sundry changing ambient conditions.

The space-instrument people came up first (in 1952) with workable mass flowmeters for two reasons. For them, measuring mass-flow rates is a necessity, not a nicety. (In space, weight has no meaning.) Then, also, they had the dollars. Profit justification is not something these people have to worry about. Development of workable mass flowmeters was neither simple nor cheap.

How indeed does one go about measuring mass flow

A Kaleidoscope of Devices Bid For CPI Mass-Flowmeter Market

	Manufacturer or Distributor	Type	Applications	Flow Range	Temp Range, °F	Pressure Range	Density Range	Price Range, $
TRUE-MASS FLOWMETERS	General Electric and Black, Sivalls & Bryson	Axial-flow angular-momentum	Liquids and gases	250-53,000 pph (gases), 2000-320,000 (liquids)	0-165	0-1500 psig (gases), 0-1500 (liquids)	0.1-30 lb/cu ft (gases), 30-90 (liquids)	2000-3000
	Avien	Axial-flow angular-momentum	Liquids	0-250,000 pph	−65 to +300	0-1000 psi	0.2-1.5 (specific gravity)	2000-2500
	Bendix, Pioneer-Central Division	Axial-flow angular-momentum	Liquids	Up to 300,000 pph	−320 to +375	Up to 1600 psi	50 to 70 lb/cu ft	Available on request
	Foxboro, Waugh Engineering Division	Axial-flow angular-momentum	Liquids and gases	1 ppm minimum	−420 to +500	0-10,000 psi	0.1-100 lb/cu ft	1500-5000
	Potter Aeronautical	Axial-flow linear-momentum	Liquids	From 5 gpm	−430 to +850	Unlimited	0.8-1.2 (specific gravity)	From 1440
	Decker	Gyroscopic angular momentum	Liquids and slurries	6-600 ppm	To 200	100 psia	Unlimited	3500-4500
EFFECTIVE-MASS FLOWMETERS	Neptune Meter, Revere, Subsidiary	Volumetric flowmeter and densitometer	Liquids	250-7400 ppm	−65 to +140	To 125 psig	5.4-7.4 lb/gal	Available on request
	Rotron Manufacturing	Velocity flowmeter and densitometer	Gases	100-2,000,000 pph	32-500	15-2000 psig	1-25.5 lb/cu ft	From 3000
	George L. Nankervis, Cox Instruments Division	Velocity flowmeter and densitometer	Liquids	1-12,000 gpm	−65 to +140	Unlimited	0.5-2.0 (specific gravity)	Available on request
	Fischer & Porter	Magnetic flowmeter and radioisotopic densitometer (not made by Fischer & Porter)	Liquids, slurries and solids	Unlimited	To 375	To 30,000 psi	Unlimited	4000-40,000 (excluding densitometer)
	Foxboro	Magnetic flowmeter and radioisotopic densitometer (not made by Foxboro)	Liquids, slurries and solids	From 0.1 gpm	To 300	150-240 psi (standard)	0.8-2.0 (specific gravity)	Available on request
	Maxson Electronics	Ultrasonic flowmeter and densitometer	Liquids and gases	Available on request				
	Gulton Industries	Ultrasonic flowmeter and densitometer	Liquids and slurries	15-3000 gpm	To 250 (standard)	Available on request		From 4000
	National Instrument Laboratories	Orifice flowmeter with static-pressure and stream-temperature self-compensations	Gases	To 1000 lb/min	−50 to +500	0-900 psig	Unlimited	350-3400
	Hastings-Raydist	Heated thermopile	Gases	0-30,000 scc/min (0-2000 scfm probes are available)	−300 to +300	To 200 psi (standard)	Unlimited	250-390



A Kaleidoscope of Devices Bid For CPI Mass-Flowmeter Market

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	Fischer & Porter	Magnetic flowmeter and radioisotopic densitometer (not made by Fischer & Porter)	Liquids, slurries and solids	Unlimited	To 375	To 30,000 psi	Unlimited	4000-40,000 (excluding densitometer)
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	Hastings-Raydist	Heated thermopile	Gases	0-30,000 scc/min (0-2000 scfm probes are available)	−300 to +300	To 200 psi (standard)	Unlimited	250-390

Mass flowmeters . . . ready to orbit *continued from preceding page*

directly? This is a problem which can become quite mathematical and involved very quickly, but we can get a good idea of the basic approaches involved by taking a look at only one equation — a general one for mass-flow rates:

$$M = A\rho V$$

where: M = mass-flow rate
ρ = density
V = velocity
A = cross-sectional area

With a constant cross-sectional area, all that need be done to obtain mass-flow rate is to measure ρV. Since ρV represents the momentum of the stream per unit of cross-sectional area, then the problem of obtaining a mass-flow reading resolves itself into a problem of obtaining a measure of momentum of the stream. Devices which do this are called true-mass flowmeters.

Most true-mass flowmeters operate on the angular-momentum principle. That is, they impose a momentum or velocity on a fluid stream at an angle to the longitudinal flow. In this manner, a reading proportional to the stream momentum is obtained.

A second basic method of mass flowmetering is to compute the value from conventional process-measurement signals. Such instruments are categorized as effective-mass flowmeters. With this approach, there are three general techniques possible.

One design consists of coupling a kinetic or pressure-differential flowmeter with a densitometer. The signal from the flowmeter gives a value equivalent to $\frac{1}{2}\rho V^2$. This signal, together with that of the densitometer, is then fed to a computer which multiplies the two and extracts the square root, either mechanically or electrically.

Another possibility is to combine a velocity flowmeter and densitometer. Computation in this case consists simply of multiplying the two signals.

A third solution is to combine a kinetic meter with a velocity meter. In this set-up, the head-meter signal is divided by that of the velocity meter to produce the needed ρV value.

Two specialized effective-mass flowmeters will be discussed, along with the other descriptions of commercially available hardware.

Obviously, since virtually every type of conventional flowmeter can theoretically be utilized in the design of a mass flowmeter, there are about as many ways to meter mass flow as there are to meter volumetric flow. While one can design one's own mass flowmeter, undoubtedly the best approach to the problem is to pick one of the many excellent commercially available packaged units.

There are six true-mass flowmeters from which to choose. Probably the best known of these is the axial-flow angular-momentum model sold by both General Electric Company and Black, Sivalls & Bryson, Inc.

This is due in part to the fact that the original GE aircraft design has been successfully utilized in the natural-gas industry, an area more akin to the CPI than the outer reaches of space. Obtaining mass flow rate is extremely important in that field because heat energy in a lb of gas varies less with composition change than does heat energy on a cu-ft basis.

The flow-rate sensor located in the fluid stream consists of two cylindrical elements — the impeller and the turbine. Both elements contain channels through which the fluid flows. The impeller is driven at a constant speed by a synchronous motor through a magnetic coupling.

The impeller imparts an angular velocity to the fluid as it flows through the meter. The value of this angular momentum added to the fluid is proportional to the mass rate of flow. Measurement of this mass rate of flow is performed by a second cylinder or turbine, placed downstream from the impeller.

The second cylinder removes all angular momentum from the fluid. In doing so, it receives a torque proportional to the angular momentum. The torque, proportional to the mass rate of fluid flow, is independent of fluid-density fluctuations.

The gyro-integrating mechanism receives this torque through a magnetic coupling. The torque is applied around the minor axis of the gyroscope. This causes the gyro to rotate about its major axis at a rate proportional to the torque (and thus to the mass rate of fluid flow).

The precession (rotation) of the gyroscope is transferred through a gear chain to a cyclometer register. Here the mass flow of the liquid or gas is recorded in lb.

Avien, Incorporated, Pioneer Central Division of The Bendix Corporation, and Waugh Engineering Division of The Foxboro Company also offer axial-flow angular-momentum mass flowmeters.

Avien's version operates in essentially the same manner as does the GE type. Only a single turbine is used in the Pioneer-Central design. The initial angular velocity is reduced to zero by means of straightening vanes.

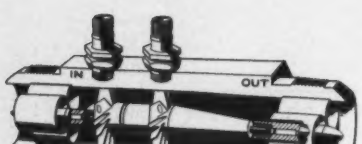
Angular acceleration force is measured as an angular deflection of a linearly calibrated spiral spring. Both turbine and cage sleeve surrounding it rotate at equal speeds to minimize viscous coupling. Turbine rotation and spring deflection both are obtained by magnetic couplings.

Waugh Engineering's meter takes the Pioneer-Central approach in that it also uses only a single turbine. This is turned at constant torque by a rotating permanent-magnet hysteresis drive. Magnet-strength changes due to temperature are compensated for by varying the air gap with a temperature-sensitive disc.

A pick-off coil converts rotor speed into an AC signal whose frequency is inversely proportional to mass-flow rate. It has an optional viscosity compensator, providing AC accuracy up to about 30 centistokes.

The Potter Aeronautical version is the only non-angular momentum true-mass flowmeter on the market. It incorporates a rotor having two sets of turbine blades with different blade angles. These are coupled by a spring and capable of relative angular motion with respect to each other. When fluid passes through the flowmeter, the two sets of blades tend to rotate at different speeds, but cannot because of the spring coupling.

However, the two sets of



Potter Aeronautical

Gulton Industries



How about solids?

With the exception of the magnetic mass flowmeters (which can be used with both solids and liquids), this article takes up only liquid and/or gas mass flowmeters.

Several units have been developed primarily for solids-mass-flow applications. A brief round-up article in the November issue of CHEMICAL PROCESSING will cover this field.

blades do take an angular displacement with respect to each other. The magnitude of this displacement is proportional to the flow momentum. Considered as a unit, the rotor assembly rotates at a speed directly proportional to average fluid velocity.

By measuring the elapsed time taken for the phase-angle displacement to traverse a reference point, a direct measure of mass-flow rate is obtained.

The gyroscopic angular-momentum principle is utilized in another type of true-mass flowmeter. Right now, the only one of this design commercially available is produced by The Decker Corporation.

In their design, the liquid is caused to flow around a circular loop of pipe which is in a plane perpendicular to the input line. Following one path around this loop, the fluid is returned to the input axis. During this rotation, the liquid develops angular momentum as is developed by the rotor of a gyroscope.

The loop is vibrated (through a small angle of constant amplitude) about an axis in the plane of the loop. This vibration results in an alternating gyro-coupled torque about the mutually orthogonal axis. The peak amplitude of this torque is directly proportional to mass-flow rate.

All other mass-flowmeter designs now in the market are of the effective type. Revere Corporation of America, Subsidiary of Neptune Meter Co., has designed one which incorporates a volumetric flowmeter and a densitometer. Fluid flow drives a positive-displacement oscillating piston to give a volumetric signal.

The densitometer utilized is a servo-controlled self-balancing hydrometer. A weight on a beam is continuously positioned to counter-balance float buoyancy. A mechanical signal from this hydraulic servo is also delivered to the mechanical converter.

In the converter, a variable ratio drive between the volumetric signal and the den-

To page 47

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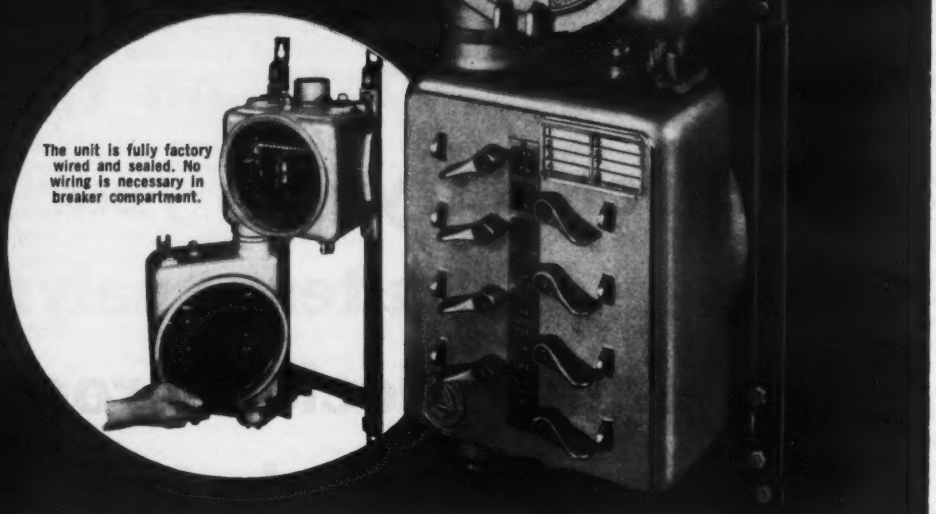
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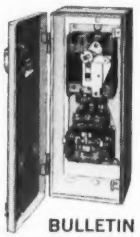
Bulletin 712, Size 1 combination starter with fused disconnect switch

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Rating for rating, the new Bulletin 712 motor starter will outperform and outlast all others. Complete safety for the operator is assured because the cabinet door cannot be opened until the lever is moved to the OPEN position, which opens the visible contact disconnect switch.

The Bulletin 713 combination starter provides similar features for complete safety, but uses an ITE circuit breaker as a method of disconnecting.

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BULLETIN 713
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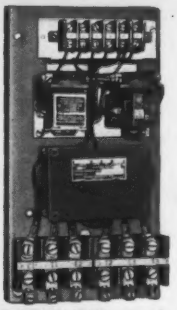
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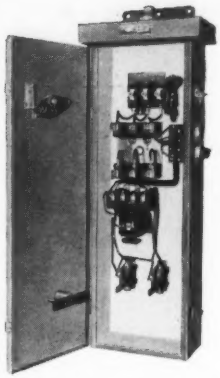
QUALITY
MOTOR CONTROL

Your A-B Handy Catalog Lists These Control Devices Often Considered "Special"



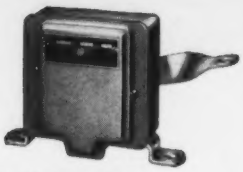
BULLETIN 812
Phase Failure—Phase Reversal Relays

Style F relay (above) protects against all open phase conditions on a branch motor circuit. Style R disconnects the motor upon a phase reversal. Style RF gives phase failure and phase reversal protection.



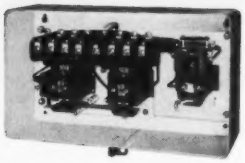
BULLETIN 1232
Pump Control Panels

Complete units for automatic operation of irrigation and oil well pumps. Employ standard A-B Bulletin 709 magnetic starter with manual disconnect switch or circuit breaker in weatherproof enclosure. Wide variety of optional features available.



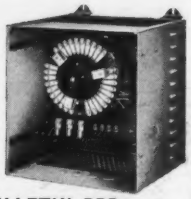
BULLETIN 840
Float Switches

These quality switches are available in a wide range of types for automatic control of motors operating tank or sump pumps. The snap-action switch mechanism assures positive operation, no matter how slowly the liquid level changes.



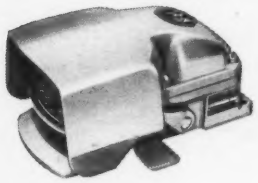
BULLETIN 1270
Automatic Transfer Switches

These switches are designed to transfer power-load to standby supply when normal power fails or drops too low. Automatically returns load to normal supply when power is resumed. Mechanically interlocked.



BULLETIN 555
Speed Regulators

Provide manual speed control of wound rotor motors for either fan or machine duty. When used with magnetic starter, the first step closes control circuit.



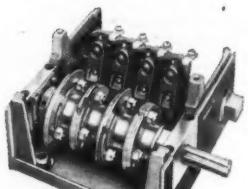
BULLETIN 805
Foot Switches

Ruggedly built to withstand the most severe industrial usage. Snap-action switch mechanism features maintenance free silver contacts. The foot switch shown above assures complete "safety" for the operator. Also made without top guard.



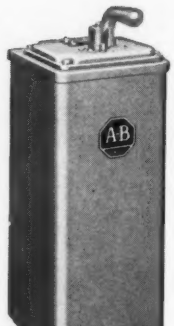
BULLETIN 836
Pressure Controls

For machine tool hydraulic systems operating at pressures up to 5000 psi. Oiltight enclosure. Operating pressure and differential are adjustable. A visible indicator shows trip point. Maintenance free silver contacts.



BULLETIN 803
Rotating Cam Limit Switches

Heavy-duty controls for use on automatic production machines. Made with up to 12 independent circuits which can be separately adjusted for operation at any point of rotation.



BULLETIN 365
Multi-Speed Drum Switches

Designed for manual starting, speed changing, and reversing of polyphase multi-speed motors. Made for up to four speeds either non-reversing or reversing.

ALLEN-BRADLEY
Member of NEMA
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

QUALITY MOTOR CONTROL

From page 45

sity signal produces a mass-flow indication.

The manufacturers have come up with four approaches to the problem of designing a mass flowmeter utilizing a velocity flowmeter and a densitometer. Rotron Manufacturing Company, Inc. has a version intended only for gas applications.

Stream velocity is measured by the vortex-velocity principle. This vortex is fed a small part of the gas by diverting some of the gas to the center of a rotor incorporating curved blades. This gas, flowing radially out through the curved blades, helps to turn the rotor. In this manner it compensates for the power losses of the vortex. Part of the gas flow is diverted past the rotor to serve as a calibration adjustment.

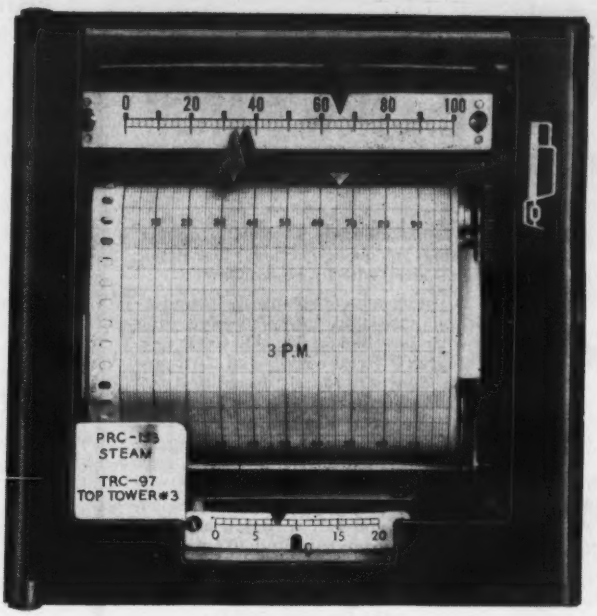
A blower continuously samples the gas and determines its density. The constant-speed fan, being coupled to a fixed system, produces a pressure differential proportional to fluid density. Velocity and density signals are multiplied electro-mechanically in a computer unit.

Cox Instruments Division of George L. Nankervis Company is the maker of a conventional velocity-flowmeter/densitometer unit.

Another velocity-flowmeter system incorporates a magnetic flowmeter and a radioisotopic densitometer. The Foxboro Company and Fischer & Porter Company both make magnetic flowmeters for use in such applications. Radioisotopic densitometers for these systems are produced by Industrial Nucleonics Corporation and The Ohmart Corporation.

In such a set-up, the magnetic flowmeter is mounted directly into the same line as the nuclear density gage. Signals from both are sent to separate recorders, then into a third which multiples the two and gives a readout in mass flow. *To next page*

For more information on product at left, specify 5603 . . . see information request blank opposite last page.



New Bristol Series 670 Metagraphic receivers measure only 7" wide by 7⅛" high on panel, come in a wide selection of models, including 1-, 2-, and 3-pen models and models with manual-automatic, manual-cascade, and manual-automatic-cascade control stations.

Now: the USER-PLANNED Receiver *New Bristol Metagraphic*

offers you more features for easy installation, flawless operation, and fast, no-down-time servicing than any other 4-inch-chart pneumatic receiver.

At last, here's the ideal pneumatic receiver for graphic panel applications.

It's Bristol's new Series 670 Metagraphic, the receiver with complete plug-in versatility and convenience, plus these new user-designed features:

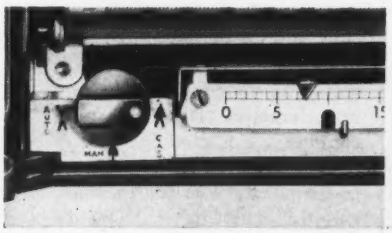
Simplified control switching between functions—Allows the easiest start-up procedures for automatic or cascade operation. Just adjust process to line up color-coded indicators and switch to automatic or cascade operation as desired.

Uniform control switching—All receiver models have the same convenient, easy-to-remember switch positions for the various types of control: cascade position; 3 o'clock; manual position, 6 o'clock; and automatic position, 9 o'clock.

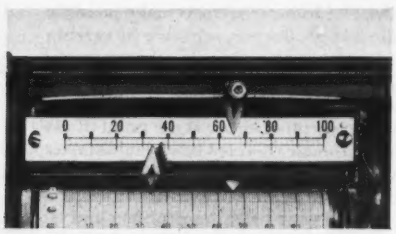
Simplified chart change and inking—Chart changing is a one-hand operation. A new chart can be slipped into place in an instant. The capillary inking system can be filled from the front of the receiver.

And that's not all: Series 670 gives you such outstanding features as rectilinear chart coordinates for easiest reading, easy connections for any type of control, and sparkless mercury-switch disconnect of electrical circuit when plug-in chassis is withdrawn.

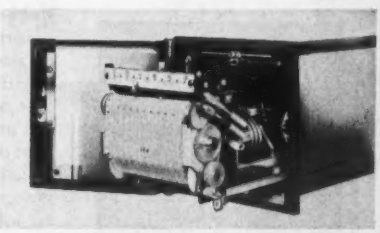
Write for complete data on the new Series 670 today. The Bristol Company, 141 Bristol Road, Waterbury 20, Conn., a Subsidiary of American Chain & Cable Company, Inc. 0.43



Simplified, uniformly-planned control switching facilitates process start-up and operator training.



Brightly-colored distinctively-shaped pointers signal process deviation from set-point, even at a distance.



Complete plug-in versatility—long a Metagraphic feature—insures continuity of service.

BRISTOL...for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Check 5604 opposite last page.



Ranges: 15—30—60—100—160—200—300—600 and 1000 lbs. Also 30" vacuum. All gauges 2½" dial; ¼" bottom connection.

A gauge that *fits in*—to a wide range of plant and original equipment uses.

MARSH

GAUGES • THERMOMETERS • VALVES

Have you seen the New MARSH "Service Gauge"?

A remarkable new series of 2½" gauges brings you quality, accuracy and stamina—along with REAL economy!

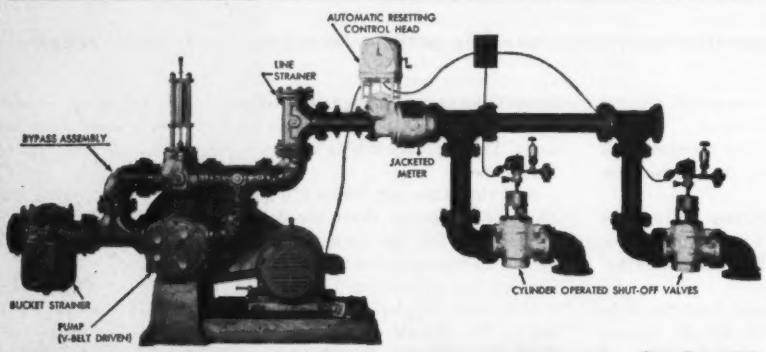
All gauges have strong 2½" bonderized case and brass screwed ring with bevelled glass. All have new Marsh "Read-easy" dial. All are *standard* with Marsh "Recalibrator." Every gauge is guaranteed accurate within 1% of dial reading.

Two types covering wide range of needs available: Type 11 with copper-alloy bourdon tube, silver brazed, and bronze-bushed movement. Type 11S with 316 stainless steel bourdon tube and 303 stainless tip and socket; stainless steel and monel movement.

Ask For New Bulletin

MARSH INSTRUMENT COMPANY
Dept. Z, Skokie, Ill.
Division of Colorado Oil & Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta, Canada, Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas. Eastern Seaboard Warehouse: Marsh Instrument Company, 1209 Anderson Ave., Fort Lee, N.J.

Check 5605 opposite last page.



TYPICAL MULTI-VALVE FLUIDOMETER SYSTEM for a more flexible production schedule

ANYTHING that can be handled through a meter can be accurately and economically batched by the FLUIDOMETER

Multi-valve Fluidometer systems make possible a more flexible production schedule by varying the size of the batches, or by using the automatic resetting control to deliver the same quantity time after time. A multi-valve Fluidometer system may be controlled either at the point of use or at the Fluidometer control head. Fluidometer installations are available either jacketed or unjacketed and are "tailor made" to fit the particular job. Tell us your batching problem and let us give you our suggestions for solving it.

Bulletin Fl-56 will be sent on request. For information on jacketed pipe and fittings write for Bulletin J-56.

HETHERINGTON & BERNER INC. • *ENGINEERS-MANUFACTURERS*
A Wholly Owned Subsidiary of American Hoist & Derrick Company
701 KENTUCKY AVENUE INDIANAPOLIS 7, INDIANA

Check 5606 opposite last page.

INSTRUMENTS & LAB

A third velocity-flowmeter approach utilizes an ultrasonic flowmeter and densitometer. Such systems are available from both Maxson Electronics Corporation and Gulton Industries, Inc. In both systems, the densitometer is an acoustic-impedence detector (an ultrasonic transducer). Acoustic impedence is the product of fluid density and ultrasonic speed of propogation. Division by the latter results in the desired density value. Again, as in the other two systems, the velocity and density signals are multiplied to obtain mass-flow rate.

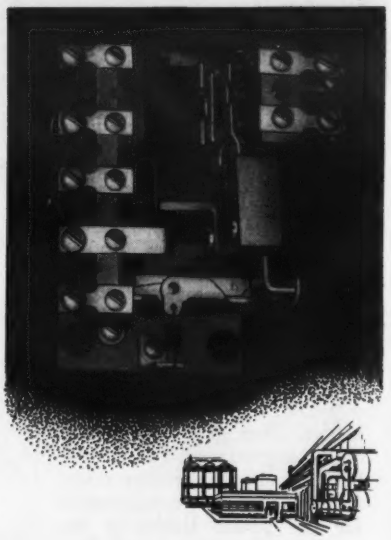
There are two special mass-flowmeter designs which are for gas. One, manufactured by National Instrument Laboratories, Inc., is a head-type (orifice) flowmeter, with self-compensation for both static pressure and stream temperature. Its output is differential pressure.

The orifice area is controlled by shaped plug positioned by the soft bellows into which is sealed a sample of the gas being measured. Both stream pressure and temperature changes will affect bellows' length and reposition the plug so that effective orifice area is inversely proportional to the square root of pressure divided by temperature. This is exactly the compensation needed to make the square root of differential pressure proportional to mass-flow rate.

Another special gas mass flowmeter is made by Hastings-Raydist, Incorporated. It utilizes the heated-thermopile and operates on the principle of heat loss as a function of the mass-flow rate for a specific gas. A low-voltage AC bridge circuit has two noble-metal thermocouples as sensing elements. These thermocouples are heated by AC. A change in flow causes a change in temperature of the thermocouples, resulting in DC output.

A third thermocouple is included in the DC-meter circuit. The couple is heated and is the same size as the heated couples. A change in ambient temperature develops voltages

Performance-proved on countless* PUMPING, VALVING, SIGNALLING *and flow control applications!



B|W

Floatless Liquid Level
CONTROLS

For accurate, reliable means of controlling conductive liquids, you'll do well to specify "B/W"—the original line of floatless level control equipment that has been thoroughly proved in use on countless applications for more than a quarter century.

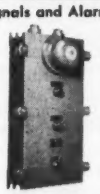
☐ Consisting of a rugged B/W relay connected to one or more electrodes, each control system is easy to install, completely automatic in operation, and unaffected by pressure, temperature, acids, alkalis or caustics. And they're available in a wide range of standard and special types to meet your particular application requirements.

Other Reliable B/W Floatless Liquid Level Control Equipment


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THE B|W CONTROLLER CORPORATION
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Manufacturers of Liquid Level and Industrial Motor Controls

Check 5607 opposite last page.

in all the thermocouples. But, the transient effects in heated and unheated elements are equal and opposite. So, the unheated couple compensates for change in ambient temperature.

The thermopile instrument is a mass flowmeter as long as the square root of $KS\rho$ is a constant, where K is the thermal conductivity, S is the specific heat at constant volume, and ρ is the density. This term is a constant for most gases over a wide range of temperatures and pressures.

Several other manufacturers are in various stages of development on mass flowmeters. Hydropoise, Incorporated, Subsidiary of Brooks Instrument Company, Inc., is working on an angular-momentum true-mass flowmeter. Rockwell Manufacturing Company and Propulsion Development Laboratories are reportedly readying mass flowmeters for the market. Also, Gulton Industries, Inc., may well have a new mass-flowmeter design in the works.

About the only general drawback to mass flowmeters is their price: usually around $2000 to $5000, but sometimes as much as $40,000, depending upon accuracy desired. Obviously, they aren't worth this kind of money to everyone. However, there are plenty of chemical applications where they are worth every penny. Whether or not yours is one is something you will have to determine yourself.

Which mass flowmeter is for you? To answer this question you should first look over the table on p. 43. Comparison of the conditions of your particular application against the listed specifications for the various makes of mass flowmeters will quickly narrow down your choice.

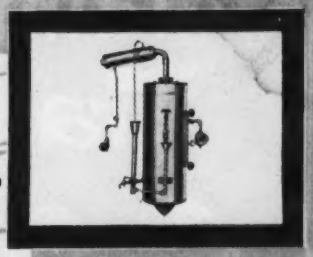
Of course, even after you have culled the selection in this manner, your choice may well still be a matter of which general design approach you prefer. True-mass flowmeters have an advantage over their effective-mass counterparts in doing the job more directly in less space.

To page 64

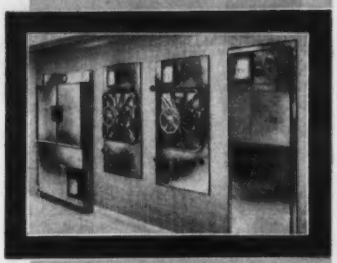
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FREEZE DRY EQUIPMENT
Models for laboratory, pilot plant and production. Used for the preservation and concentration of labile substances.

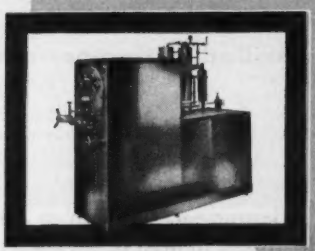


WATER STILLS and DEIONIZERS
STILL capacities from ½ to 500 gal./hr. Steam, Electric or Gas heat. Automatic or manual controls.
DEIONIZERS — Complete line ranging from 2 to 1000 gal./hr.



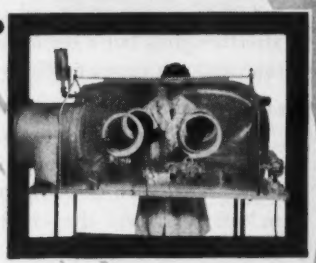
STERILIZERS
Pressure Steam, Ethylene Oxide and Combination Gas-Steam models. Chambers 16" x 16" x 24" to 60" x 66" x 120".

CONTINUOUS CULTURE APPARATUS
"Biogen" Continuous Culture Apparatus produces microbial cells and/or their byproducts on a continuous or batch basis under precisely controlled conditions.



DRY BOXES
Flexible Film disposable chamber. Economical, efficient and easy to use. Ideal for laboratory and production.

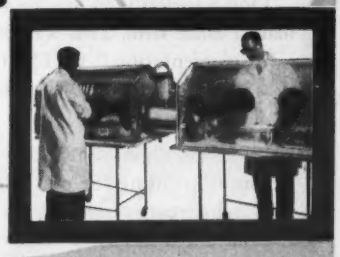
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Flexible Film Isolators for operating, rearing and transfer of germ-free animals. Economical, disposable chamber.



For good reason more and more universities, pharmaceuticals and industrials confidently specify AMSCO Freeze Dryers, Sterilizers, Water Stills and other specialized microbiological equipment. Each is designed and built to accomplish a specific job better . . more dependably . . and with less time and attention from the staff.

If you have a problem in the area of technical microbiological equipment, a letter to our Scientific and Industrial Department may lead to its economical resolution.

Meanwhile we'll be happy to send along literature on any of the equipment illustrated.



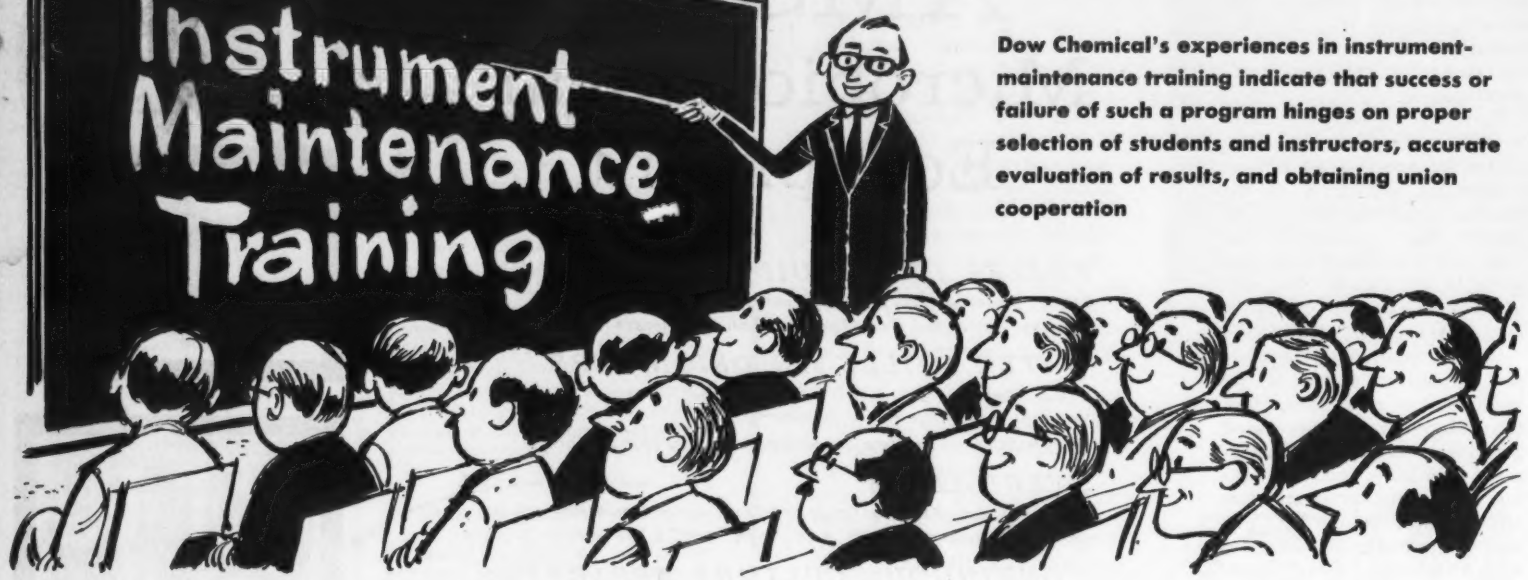
SCIENTIFIC AND INDUSTRIAL DEPARTMENT

AMERICAN STERILIZER
ERIE • PENNSYLVANIA

World's largest designer and manufacturer of Sterilizers, Operating Tables, Lights and related technical equipment for hospitals, industry and the biological sciences

Check 5608 opposite last page.

Instrument Maintenance Training



Dow Chemical's experiences in instrument-maintenance training indicate that success or failure of such a program hinges on proper selection of students and instructors, accurate evaluation of results, and obtaining union cooperation

Skilled instrument-maintenance men are made, not born

Underrating the importance of maintenance is a dangerous practice all too often indulged in by operating management. When it comes to instrumentation, such an attitude is sure to prove disastrous. In most of the chemical plants being built today, instrumentation and control are no longer afterthoughts, but a cornerstone of design. Thus, downtime and erroneous readings cannot be tolerated.

Instrument-maintenance personnel therefore must be of the highest caliber to handle the increasingly complex job of keeping instrument hardware "healthy." Since such skilled people do not just walk in "off the street," they must be obtained in some other way.

One solution is to use the services of a contract-maintenance firm. This was discussed in, "CM for instrumentation," CHEMICAL PROCESSING, p. 61, January 1961. The other alternative is to train them yourself.

If you choose the latter course, this article is "*must*" reading for you. The author draws upon his years of experience with Dow in giving invaluable tips to anyone organizing an instrument-maintenance training program. Even if you have such a program now, you are sure to find some tasty food for thought here.

By ROLAND S. GRAMBAU, Instructor, Maintenance Education Department
Midland Division, The Dow Chemical Company

PROBLEMS involved in any instrument-maintenance training program are many and varied, such as: What training is needed; what qualifications should students have; who does the teaching; should pay rate be associated with training; and what if the student fails?

Experiences we have had at Dow in this area might serve as a guide to those considering or now operating courses of instruction for instrument-maintenance personnel.

Students — A very careful selection of the men to be trained is necessary. Each applicant for our training program must be a high school graduate or the equivalent. He must have had at least one year of algebra and one year of high school chemistry and/or physics.

The applicant must pass a battery of tests which give an indication of intelligence, personality and mathematical and mechanical achievement, aptitude and interest. Physical requirements are also considered. Finally, an interview by the department head is arranged to obtain more information on past work, educational experience and personality.

Faculty — The advantages of the foreman or superintendent doing the instructing are obvious. However, there are two drawbacks: 1) Generally these individuals are not skilled or trained in the techniques of good instruction. 2) They usually cannot take enough time from their supervisory duties to prepare properly for classes.

We have had good results from using a full-time instructor with a background in education, some training or experience in the field, and a desire to teach. He, in turn, works closely with the supervisors.

In the classroom — Originally we bought a good deal of prepared course material, then added to and supplemented it with materials prepared in the plant that better suited our needs. Occasionally, a short course on specialized instrumentation will be added. This may run for two weeks or so.

The standard courses taught are listed below in the order they are given, with the number of class-hours spent on each in parentheses.

1) Mathematics and Basic Electricity	(62)
2) Physics Review	(30)
3) Blueprint Reading	(24)
4) Instruments I	(80)
5) Instruments II	(108)
6) AC-DC Theory	(72)
7) Electronics	(106)

Here's how Dow rates trainees . . .

THE DOW CHEMICAL COMPANY

MAINTENANCE DEPARTMENT RATING FOR HELPERS AND SENIOR HELPERS

Name _____ Department _____

Rating Period: From _____ To _____ Days absent (Optional) _____

Return this form to Maintenance Educational Department by _____ Score _____

(Instructions on Reverse Side)

REQUIREMENTS	SATISFACTORY — HOW DOES HE MEASURE UP TO THESE REQUIREMENTS?		UNSATISFACTORY
1. A satisfactory day's work.	Rapid worker. Usually did more work than required.	Steady worker. Completed jobs with little wasted time.	Wasted too much time; lazy; slow.
2. Ability to perform jobs assigned.	Showed unusual ability in carrying out work assigned.	Demonstrated ability to satisfactorily carry out work assigned.	Lacked ability to satisfactorily carry out work assigned.
3. Judgment.	Excellent thinker. Decisions sound in all situations.	Used common sense. Decisions usually sound.	Illogical thinker. Decisions unsound.
4. Dependability.	Required very little supervision.	Required normal supervision.	Required more supervision than necessary.
5. Cooperation and Attitude.	Inspired good teamwork. Attitude excellent.	Obliging. Willing. Worked well with others.	Troublesome. Attitude poor. upset morale.
6. Initiative and job interest.	Tackled jobs eagerly and enthusiastically. Continuous drive.	Tried hard. Conscientious. Drive and enthusiasm good.	Listless. Lackadaisical. No drive. No enthusiasm.
7. Cleanliness.	Always practiced cleanliness in work. Left jobs in excellent order.	Neat worker. Left jobs in good order.	Often neglected to clean up jobs in good order.
8. Safety	Consistently used safe practices.	Generally used safe practices.	Indifferent to safe practices.
9. Direction of others. (Rate Only When Applies)	Unusually successful in directing others.	Effectively directed others.	Did not effectively direct others.
10. Planning for material transportation, job layout and work of men. (Rate Only When Applies)	Planning exceptionally thorough and complete.	Planned job satisfactorily.	Planning poor.

Remarks: _____ Rated By: _____

Date: _____

TRAINEE'S SIGNATURE _____

BE SURE YOU CAN JUSTIFY THIS RATING

Each man attends class from four to six hours a week in two or three two-hour periods. Classes are held during the working day in rooms provided on company grounds.

During the training period of about two years, the men spend nearly 85% of their time in the shop or field. Therefore, it is important that careful planning be devoted to seeing that the trainee gets a well-rounded work experience.

A rotation schedule is established so

At Last...

A CAPACITANCE PROBE LEVEL CONTROLLER COMBINING:

- Amazing Stability
- High Sensitivity

THE NEW Fielden TEKTOR®



World's Most Advanced Level Controller

Others think of long term drift in terms of hours . . . the new Fielden TEKTOR, after months or even years of service, holds drift to 2$\mu\mu$f maximum. Revolutionary in design and construction, the new Fielden TEKTOR offers a combination of advanced features never before available in a capacitance probe instrument.

Send today for illustrated brochure with full specifications

BUYERS BEWARE OF MISREPRESENTATION

Do not be misled by company or independent sales representatives who may be selling level equipment under the guise that it is made by Fielden. The New TEKTOR®, TELSTOR® and PNEUTRONIC® level instruments, incorporating advanced design features, can ONLY be obtained from FIELDEN ELECTRONICS, INC., HUNTINGTON, LONG ISLAND, NEW YORK or through our representatives carrying authorized credentials.

Write or call for the name of your authorized representative.

Fielden

ELECTRONICS, INC.

HUNTINGTON, NEW YORK

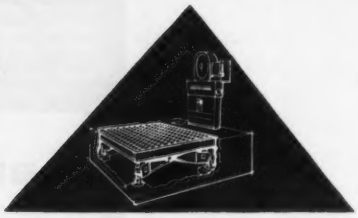
Telephone: (516) MYrtle 2-6045

Check 5609 opposite last page.



...CUT COSTS AND SAVE TIME WHEN WEIGHING MATERIALS ON POWER OR HAND TRUCKS

FAIRBANKS-MORSE WAREHOUSE SCALES



Self-Contained Scales

- For general use in factories, warehouses, shipping rooms, foundries, paper mills and other industrial applications.
- Thirty different models for your special requirements... with direct-reading "Floaxial" Dials, with or without "Printomatic" weight recorder or with Double Beam. Capacities from 600 lbs. to 3200 lbs.
- All models feature the F-M Type "S" Lever System—a suspension system that swings parallel to the direction of traffic... thus protects scientifically ground pivots and bearings... results in accuracy that lasts for longer periods of time.

Built-In Floor Scales

- Especially designed for heavy-duty use in metal working plants, steel mills, paper mills, textile mills, mines... and for general factory use.
- Available for installation in a pit or suspended from the floor, with direct-reading "Floaxial" Cabinet Dial, with or without "Printomatic" weight recorder, or Double Beam. 20 different models with capacities up to 10 tons.
- All models feature the F-M Type "S" Lever System for complete accuracy over longer periods of time.

For complete information on any or all Self-Contained and Built-in Scales, write: Department S-1; Scale Division, Fairbanks, Morse & Co.; 100 Electra Lane — East Station; Yonkers, New York.

FAIRBANKS MORSE
A MAJOR INDUSTRIAL COMPONENT OF
FAIRBANKS WHITNEY

Check 5610 opposite last page.

that the trainee will work with all the foremen and journeymen. This gives him a good opportunity to perform all phases of work required of his trade, and to become acquainted with other men he will be working with in the future.

Report card — Progress is evaluated by an in-training testing program and foremen's rating sheets. An example of the latter is presented on page 51. In-training testing includes periodic quizzes throughout each course, final exams covering a prescribed period of time in each course, and qualification tests on the practical phases of the work. If an individual fails any test, he is called to meet with his supervisor, steward and instructor to discuss his progress. If the man continues to fail, he leaves the trade. This clause in the union training agreement enables us to maintain the standards that have been established.

What about the union? — All our maintenance training is done under contract agreements between company and union. The assistance of the union should be sought when setting up or changing a program.

Without such consent, no formalized training program would be possible. In addition, union personnel often are closer to the job and better understand what is needed. Finally, greater acceptance may be gained from the men by working closely with the union.

In discussions among ourselves and with other people outside our plant, we have found varying degrees of success in obtaining labor-union acceptance of company training programs.

These problems almost always come from the union concept of seniority. That is, according to the union, the longer a man has worked on a job the more pay he should receive and the more security he should have. From our viewpoint, it is desirable to relate pay with training, and, as we have mentioned before, remove the man from his classification if he fails. This is

the basic conflict and we must admit it is a good one.

Now, the union is obviously eager to have its men trained on company time at company expense. So, they should be willing to concede to management the right to remove a trainee from his classification if he fails the course, if management is willing to upgrade in pay and status a trainee having successfully completed the course.

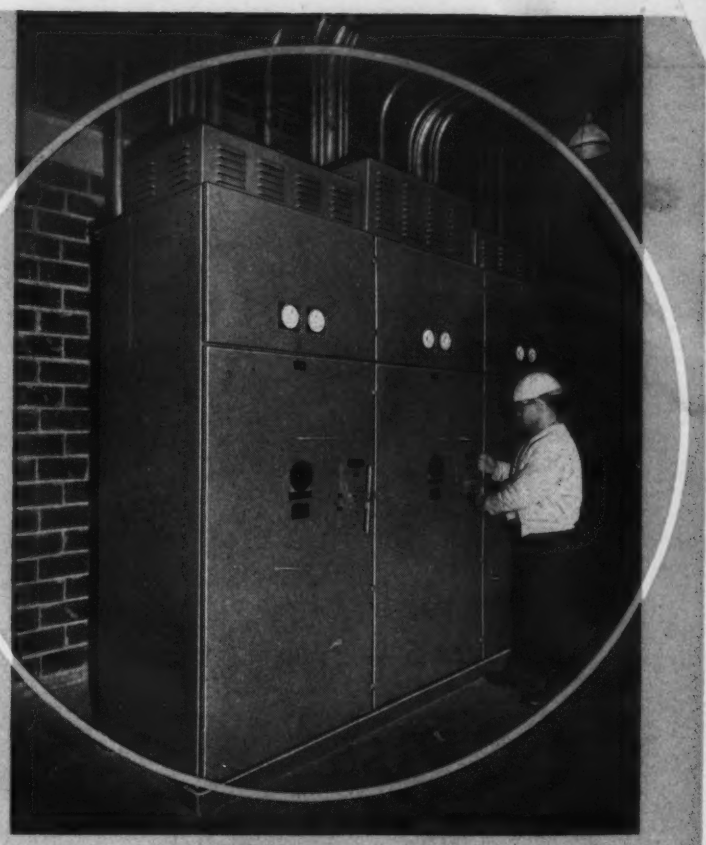
A training agreement for each phase of an employee's advancement seems more desirable than the single overall package type. Then, if selection requirements or any other part of the program should need to be changed, the whole agreement need not be rehashed.

Was it all worth it? — The problem of evaluating any education program is difficult . . . especially in terms of dollars and cents. If records have been kept on such things as job performance and labor problems, a before-and-after comparison may be made. In quality of effort we look for indications such as these:

1) Shop supervisors who use our service rate the program high on accomplishments for them. They can not operate without it.
2) Our union and our shop men share supervision's evaluation.
3) We have contributed to a reduction of men needed in our maintenance force. (eg, If the job effectiveness of each of 20 men can be improved 5% by training, it will be tantamount to adding an extra man.)
4) Trained men require less supervision.
5) We have arrived at a lower labor cost per work order. ■

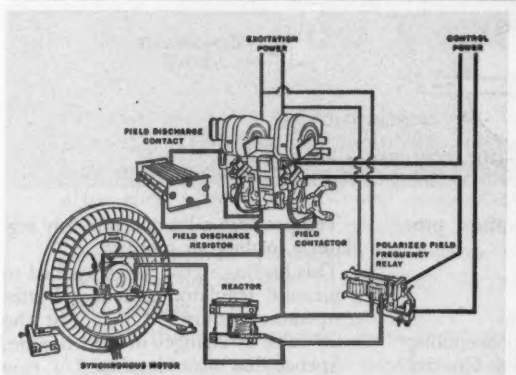
For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page.

The Most Complete Synchronous Motor Protection you can buy!



- PUSH BUTTON START!
- FULLY AUTOMATIC SYNCHRONIZATION!

EC&M High Voltage Starters provide Simple, Safe Operation



POLARIZED FIELD FREQUENCY RELAY SYSTEM used in ECaM synchronous starters is noted for its simplicity, dependability, and for fast, positive synchronization at the most favorable time.

A push of the START button gives you complete motor protection, both starting and running—plus ECaM fully automatic synchronization! Motor windings are protected throughout the entire sequence. If the motor slows down, field excitation is automatically removed—the motor is permitted to re-accelerate—and resynchronization occurs automatically when the motor reaches the proper speed. Moreover, short circuit protection is available in both air and oil-break starters for any power system up to 5000 volts.

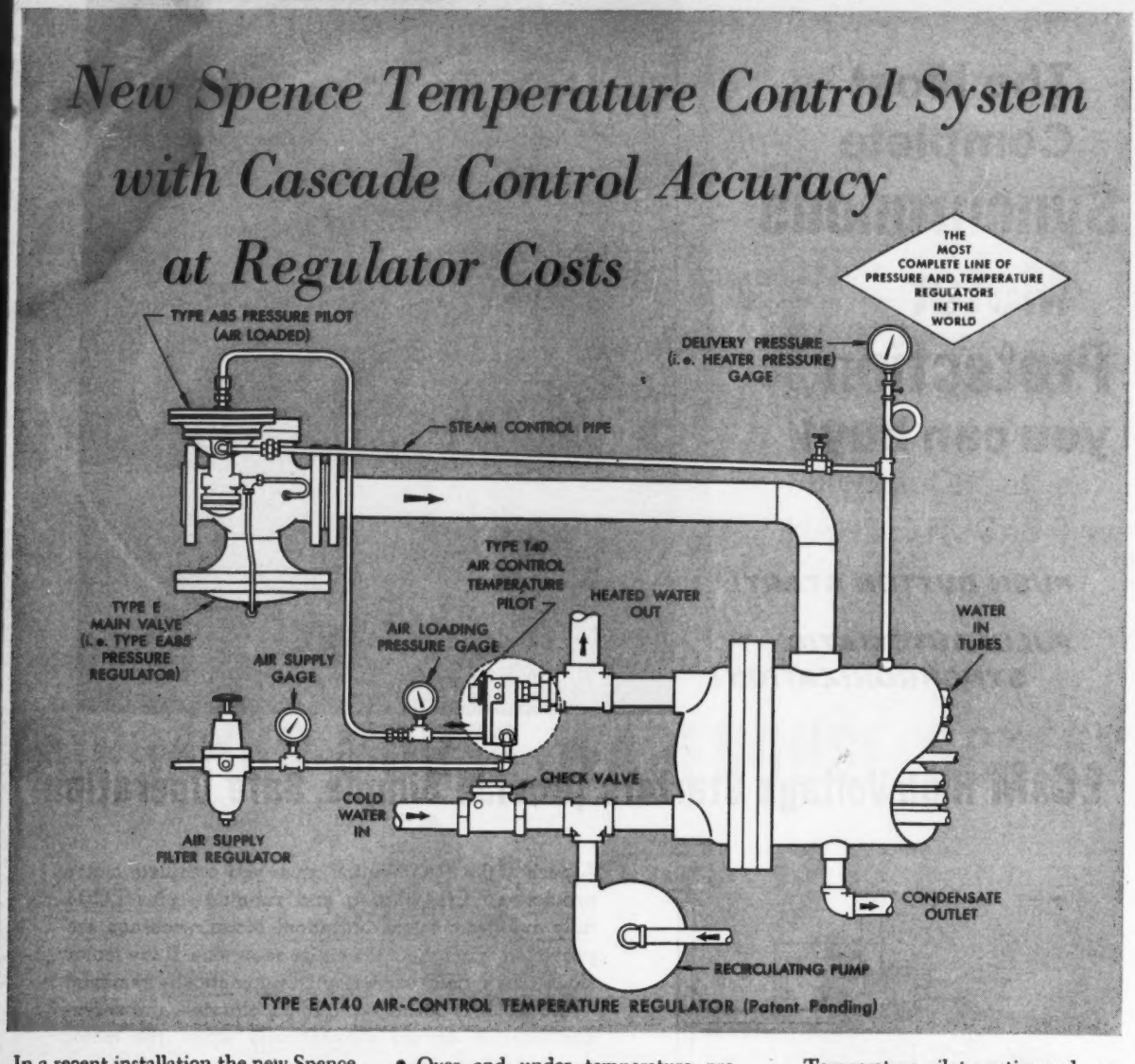
ECaM synchronous starters give the greatest motor protection plus the simplest operation and the easiest maintenance. They're available in ratings up to 4800 volts, with fuseless or fused interrupting capacity.

Write for BULLETIN 8210. Square D Company, ECaM Division, 4500 Lee Road, Cleveland 28, Ohio

SQUARE D COMPANY
EC&M DIVISION • CLEVELAND 28, OHIO
wherever electricity is distributed and controlled
6339

Check 5611 opposite last page.

New Spence Temperature Control System with Cascade Control Accuracy at Regulator Costs



TYPE EAT40 AIR-CONTROL TEMPERATURE REGULATOR (Patent Pending)

In a recent installation the new Spence air-control temperature regulating system provided:

- ±5°F control accuracy under wide and instantaneous load swings of 210 to 80 gallons per minute.
- Up to 50% reduction in cost as compared to instrument systems of similar accuracy.

This unique cascade-type control with throttling range adjustment independent of maximum heater pressure was developed to meet today's demand for greater control accuracy.

Additional features of the new Spence Temperature Control System include:

- 200°F wide adjustable temperature range
- Adjustable speed of steam pressure change
- Over and under temperature protection
- Pressure limit control
- Fast response
- Very low air consumption
- Field reversible for heating or cooling

The Spence Type EAT Air Control Temperature System, when properly installed, will tame wide ranging, fast changing loads of instantaneous heaters and modern heat exchangers. The cascade principle plus the use of an extremely fast responding bi-metal temperature sensing element reduce time lags and provide control stability.

Here's how the new Spence system operates:

Quick response is based on a bi-metal temperature sensing element.

Temperature pilot continuously regulates a loading air pressure.

This loading signal, when applied to a pressure regulator to reflect heater temperatures, causes it to adjust the main valve as changes in load require.

Spence has also developed a new pressure control system based on this same cascade principle. This system has a control accuracy of ½ psi or better from positive pressures through the vacuum range to 30" Hg.

For complete information on these new air controlled temperature and pressure control systems, write for your copy of Bulletin 9.

SPENCE ENGINEERING COMPANY, INC.
Walden 1, New York 8E-149A

Check 5612 opposite last page.

INSTRUMENTS & LAB



See them now

. . . with this versatile low-cost universal recorder. With proper sensing elements and plug-in signal modules, same recorder can read and record up to six variables such as temperature, voltage, current, light intensity, humidity, air movement, moisture, displacement and pressure.

Price range is from $300.00 (for two-channel units) to $900.00 (for six-channel models). Modules cost from $50.00 to $60.00 apiece.

(Universal recorder and plug-in modules are product of Tipptronic, Inc., 510 E. Washington St., Chagrin Falls, Ohio.)

Check 5613 opp. last page.

Severe space restrictions don't cramp the style of TV camera

One of the smallest closed-circuit television cameras in the world has recently been introduced to the U.S.

The pocket-size TV eye is nine inches long and less than three inches in diam. This is small enough to scan the interior of a three-inch pipe. Camera will operate without special protection in environments where there is a considerable noise or vibration.

The camera's small size has been achieved by placing only essential components in camera itself. Others are housed in the camera control unit which is separate from the

camera and can be conveniently spotted at some distance.

Remote control for zoom lens, focus, iris, pan and tilt . . . and full range of accessories are available. Camera is product of E.M.I. Electronics, Ltd.

(Minicamera is marketed in the United States by Electronics Division, Fairbanks, Morse & Co., a major industrial component of Fairbanks Whitney Corp., 100 Electra Lane, East Station, Yonkers, New York.)

Check 5614 opposite last page.

Variety of components blended in many ratios

A recently developed unit for use with turbine flowmeters will ratio input signals (electrical pulse train) of digital nature, one from each component stream being blended. Any number of components can be blended. Ratios of components, one to the other, can be higher than one-million to one.

Unit has output control signal amplified to operate electro-pneumatic or electro-hydraulic transducer. This in turn operates flow-control valve. Complete control console consists circuits to indicate blend flow rate, to totalize blend flow, to stop flow after pre-set blend has been delivered, and other functions as needed.

(Dirac 135 is covered in Data Sheet SY-2—Potter Aeronautical Corporation, Route #22, Union, N.J.)

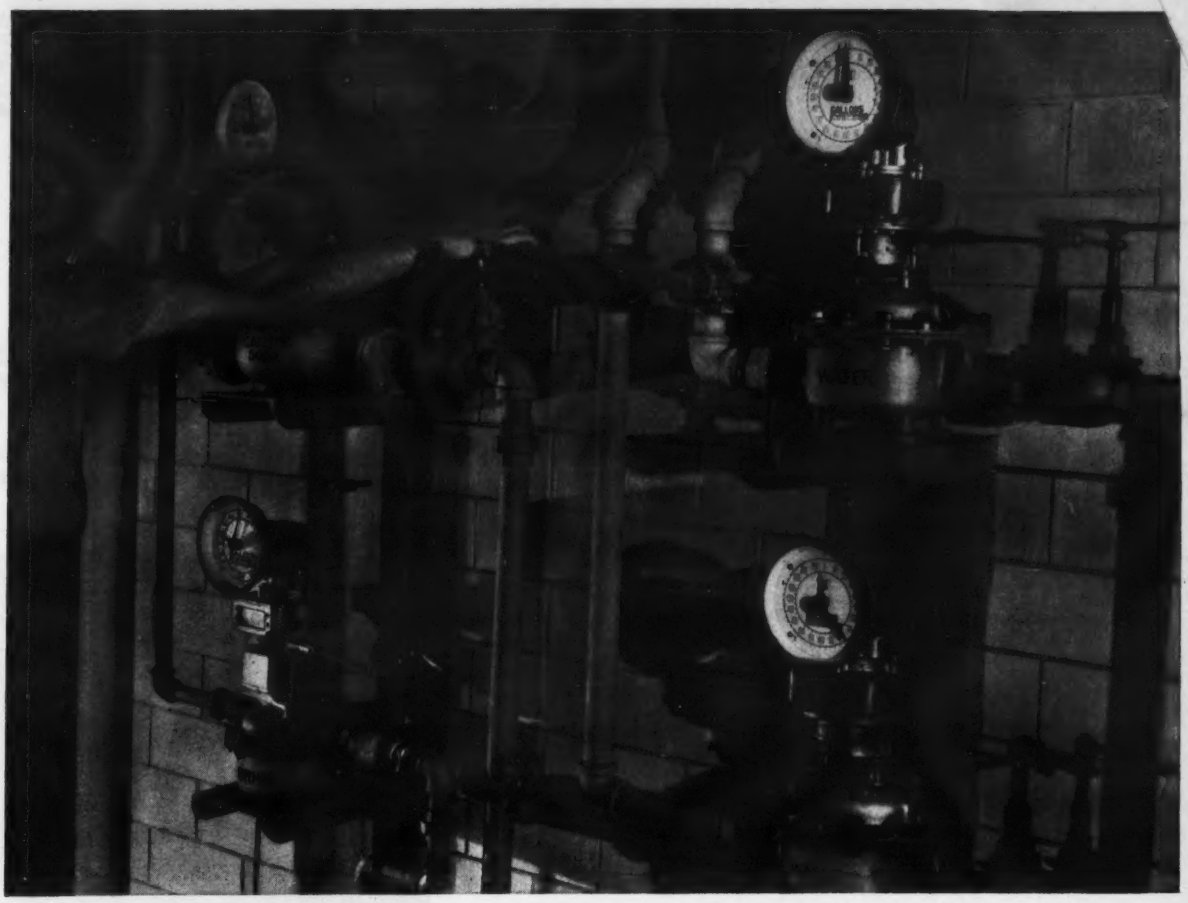
Check 5615 opposite last page.

Rotameters, their industrial uses, features of manufacturer's line and details of tube and float types available, are covered in 20-page catalog. Selection and ordering data enables user to quickly choose meter to fit his needs. Cat 520.100 — Wallace & Tiernan Inc.

Check 5616 opposite last page.

How slurry valves are used in pressure loop system for stock feed to refiners by a papermaker to increase refiner production is described in Bul 2.4-1 — The Clarkson Company.

Check 5617 opposite last page.



Meters with "mechanical brains" do your thinking at less cost

For controlling formulas, a Rockwell liquid meter thinks for itself. Once pre-set, it remembers the quantity, and shuts off automatically after each operation. Optional accessories include ticket printers for inventory and cost analysis; impulse contactors for remote registration; even controls to shut off the pump after delivery.

With this meter system there is no waiting for gauge tanks to fill, no bucketing, no errors, spillage or waste. In many cases one man can progressively formulate several batches at the same time.

You'll benefit through more production with improved quality at less cost. If you are handling volatile liquids, you'll gain the safety of a closed piping system.

Rockwell liquid meters are sold by jobbers everywhere . . . and supported by our own staff of field engineers. Use the handy coupon or write to Rockwell Manufacturing Company, Dept. 131 J, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ontario.

INDUSTRIAL METERS
another fine product by
ROCKWELL

Clip Coupon—Mail Today

Rockwell Manufacturing Company
Dept. 131J, Pittsburgh 8, Pa.

I am interested in measuring _____ (Name of liquid) • Pipe Size _____

Working pressure _____ psi • Temperature _____ °F max.

Max. Flow Rate _____ gpm • Min. Flow Rate _____ gpm

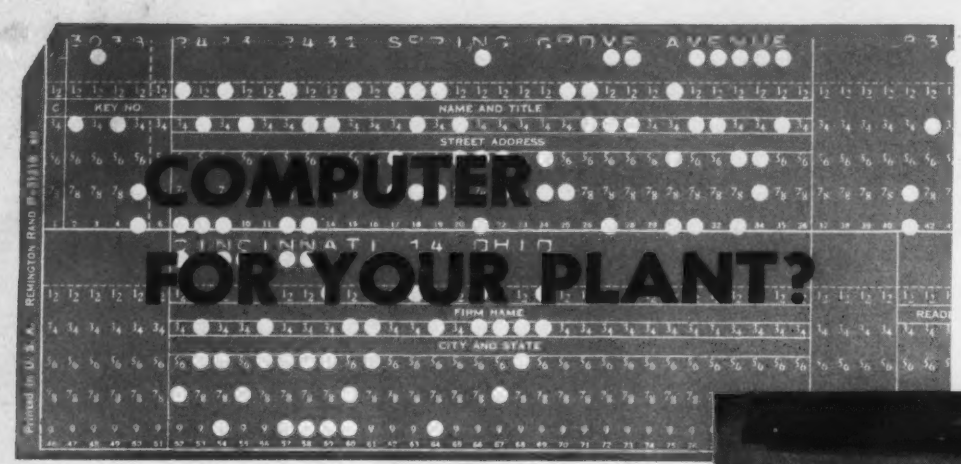
Your Name _____

Company _____

Street _____

City _____ Zone _____ State _____

Check 5618 opposite last page.



COMPUTER FOR YOUR PLANT?





Is it practical? . . . Closed- or open-loop control? . . .
What personnel are needed? . . .
How to specify the system . . .
Associated-equipment pitfalls . . .

By W. E. KORSAN and H. S. DREWRY
Industrial Systems Department
Allis-Chalmers Manufacturing Company

Computer-control Price Tags

The chart below lists the approximate costs of three degrees of process-control systems utilizing computers. The wide variation in costs in each category reflect similar variations in type and complexity of processes.

Scan & Log	Scan, Log & Computation	Scan, Log, Computation & Control
$75,000 to $100,000	$150,000 to $550,000	$400,000 to $1,500,000

NO CHEMICAL COMPANY today can afford not to evaluate the application of computers to its process-control needs. Not every process can use them economically, but some cannot efficiently be run without them. However, before one can study the value of a computer to a process, the control system must be considered.

First, pick control system — The fundamental considerations in determining process-control equipment include principally the answers to these questions:

1) Can you measure the exact conditions occurring in the process? If so, the equivalent electrical value can be obtained for use in the control system.

2) Do you know what changes occur in the process materials and where they occur? If so, instrumentation can be installed at minimum cost.

3) Do you know the permissible tolerances in the raw materials, process conditions and final product? If so, the control set points can be determined.

4) At what volume and production rate will the process be operated? What changes in rate will be required? Any determination of control-system expenditures requires this information.

5) Is the process and its control capable of further improvement by more modern instrumentation or centralized manual control? Such savings cannot be credited to the computer.

Should you have a computer? — All the aforementioned considerations are fundamental to the proper design of a process-control system for any plant or process. The increased capital expense of a computer to be used for operating guides can be profitable when one or more of the conditions listed below exist:

A) Only a computer can handle with certainty the large number of signals required to maintain correct operation of the process.

B) The rapidity of process-variable changes is beyond human capability to recognize.

C) The interrelationship of the process variables must be quickly and accurately determined and displayed.

In order to obtain *closed-loop* dynamic computer control of a process, further increases in capital costs must essentially occur. This additional investment, however, can be profitable where the following conditions exist:

a) Absolute correctness in

operation sequences are vital to product quality and/or human safety.

b) Degree of control must be precise and/or uniform.

c) Speeds of response requirements are too fast for human reactions.

Be prepared — If a conventional control system is chosen (utilizing standard instrumentation and analog sub-loops supervised by operators), it is wise to install those contacts and sensors required to make the system adaptable to computer control at a later date.

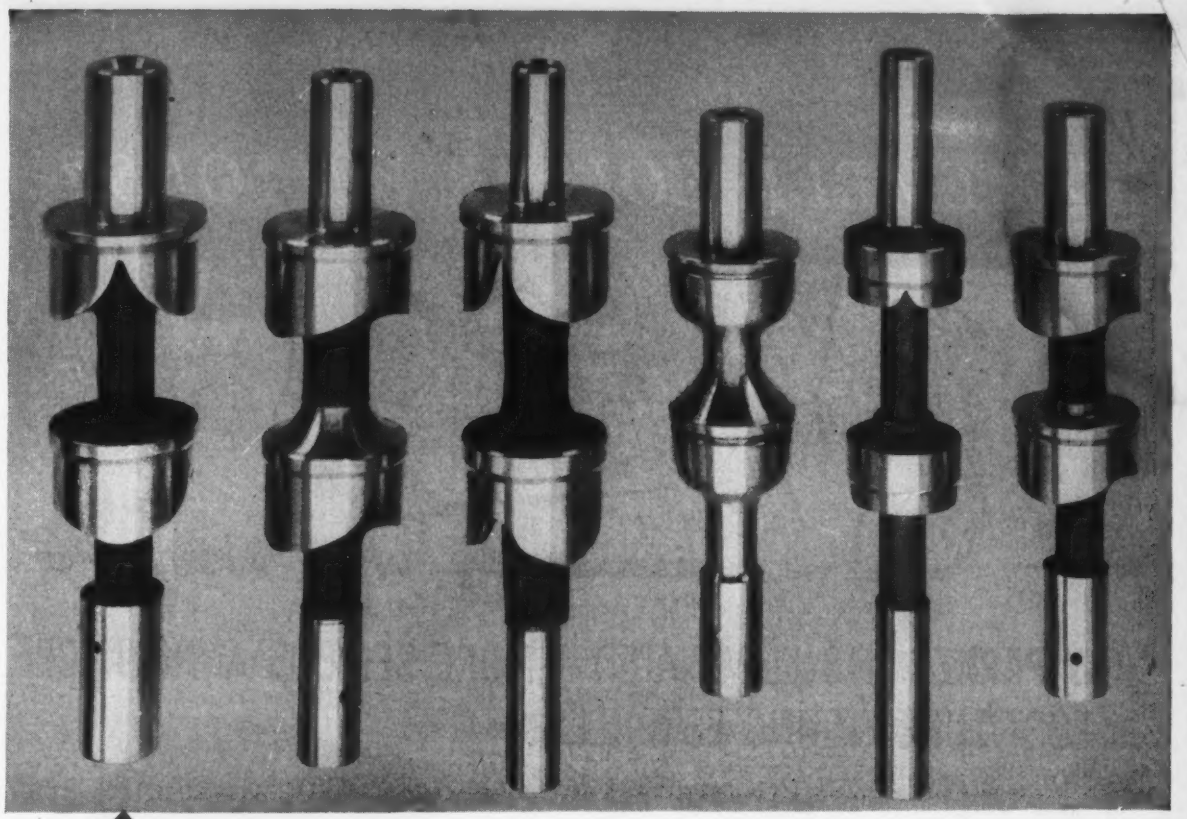
The cost of installing such additional circuitry is very small in comparison to the cost of installation. Motor-control switchgear, instrumentation and the analog control loops should be selected so as to be compatible with computer control.

Teaming up — If a computer-control system is selected as the type of process control to be used, a project team must be organized to prepare system specifications. Included on the team should be process analysts, an instrumentation engineer, a process engineer, and a representative of the operating department.

The project team reports to a manager who is in charge of the project until completion. A programmer is included on the team so that his recommendations will be included in the computer-control-system specifications. The specification should detail as exactly as possible the function of the system.

Too often a great deal of emphasis is placed on computer specifications and performance requirements without realizing the complexities inherent in the selection of signal transducers, signal-conditioning equipment and signal wiring. Similar pitfalls exist in the handling of the output control circuits.

Proper programming of the computer consists of translating process knowledge into machine instructions. If the process is not completely known to the last detail and the necessary mathematical



Inner secrets of inner valves

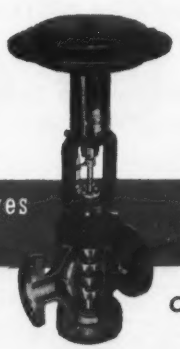
FACTS EVERY CONTROL VALVE USER SHOULD KNOW

This is a rare photograph . . . presented in a completely unretouched form. It shows the inner valve of leading makes of diaphragm control valves. The inner valve determines the control result.

The most amazing fact is the size . . . all are *listed* as two inch valves. All are high lift. But compare them.

Note the KIELEY & MUELLER inner valve at the far left. It equals the others on every point of consideration; exceeds on many. Look at the diameter across the skirt . . . that's one reason for the remarkable C_v of K&M valves. Look at skirt length; the solid, not fabricated, design. Measure the rugged guide posts and the large column. Examine the machining and the super-finishing.

It's no wonder . . . K&M is *the valve that likes to be compared.* It's a better valve and a better value by every measure of comparison.



FOR THE COMPLETE FACTS . . .
write for the K&M Valve Engineering Data Catalog, Bulletin CV53.

diaphragm control valves

KIELEY & MUELLER, INCORPORATED

K&M

Our 78th Year

Oldest Pressure and Level Control Valve Manufacturer

64 Genung Street, Middletown, New York

Check 5619 opposite last page.



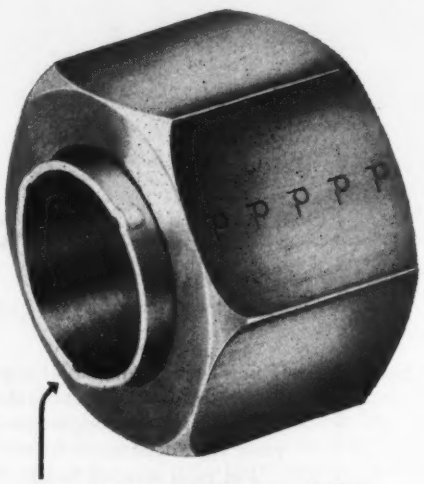
NOW **PARKER** HAS ELIMINATED A MORE SERIOUS ANNOYANCE ...LOST TUBE FITTING FERRULES!

A simple change in the design of Parker "Intru-lok®," the positive, bite-type Parker fitting for copper, aluminum or plastic tubing, has solved an age-old problem.

Small three- and four-piece tube fittings have long been a pain in the neck on applications where it is necessary to remove the nut from the fitting. The ferrule(s) fall out and promptly disappear. If and when found, they often get put in backwards. Sometimes they never get put back at all. Result, in either case: a leaking joint.

Now Parker has developed a snap-in, captive ferrule for "Intru-lok." You can take it out of the nut, "on purpose," but you can't drop it out accidentally.

You get all the leakproof safety of a three-piece fitting with positive "bite." You also get the convenience, the quick, easy assembly of a two-piece fitting. The easiest fitting to install has been made even easier. Write for new "Intru-lok" dimensions and prices today.



Three "detents" hold the "tail" of the new ferrule in the nut. Also, the larger hole in the nut makes tube bends closer to the fitting possible. Note the larger wrench flats on this huskier nut, too.

The new nut with captive ferrule is available on all "Intru-lok" fittings sizes from #2 through #8 (1/16" through 1/2" O.D.). Shown below actual size:



PARKER-HANNIFIN

PARKER HANNIFIN CORPORATION

Parker FITTINGS AND HOSE DIVISION
17325 Euclid Avenue • Cleveland 12, Ohio
PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

3278-PH

EUROPEAN DIVISION • PARKER-HANNIFIN N.V. • SCHIPHOL • THE NETHERLANDS

Check 5620 opposite last page.

relationships have not been determined, the computer program will be inadequate.

The time required for programming the computer may seem extraordinarily long and the bugs that creep into the program exceedingly numerous. However, it must be remembered that it takes years to train an operator so that he can control a chemical process. This same knowledge that the operator has gained, plus much more, must be programmed into the computer.

Due to the number of changes that have to be made in programming after installation and during the use of the control system, it is desirable that the buyer have his own programming staff.

Thus, program changes required, due to change in the basic process or changes required to optimize production, can be readily accomplished. Secondarily, the buyer may have to do a considerable amount of programming to avoid divulging proprietary process information.

Don't neglect associated equipment — Regarding sensors and field wiring, the control-system manufacturer can provide a great deal of information to the buyer.

Whether or not the manufacturer of the control system is providing the sensors, he has to utilize the signals supplied by the sensors; naturally the control system can function only as well as the signals supplied to it.

Also, very careful attention has to be paid to the interconnecting cabling between the sensors and the control system. Many computer-control systems placed in operation to date have suffered because of sensor and interconnecting-cabling deficiencies.

Conducting a number of investigations into such problems, computer-system manufacturers have developed techniques to insure that very little trouble will arise from faulty signals.

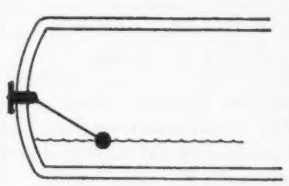
Testing — As soon as the manufacturer has completed fabrication of the control system, and the programming has progressed to a point which

would permit testing of the equipment, in-plant tests should be started.

These tests should be performed in conjunction with the buyer's maintenance and engineering personnel, in order to provide training and checkout of the control equipment simultaneously. In addition, any necessary changes which show up during the tests can be incorporated readily while the equipment is still at the manufacturer's plant.

The computer system should be provided with enough controls to permit manual operation. Since most processes operate on a 24-hr/day basis, they must be capable of being controlled manually. This consideration accounts for a large portion of the cost difference between conventional- and computer-control systems.

The need for duplication of controls will diminish as computer-system equipment and application techniques improve. ■



Only three screws

. . . are needed to hold indicator mechanism within permanently welded sleeve and dome assembly of tank-contents gage.

It may be used in applications to 1000 psi. Gage is made of type-316 stainless steel. Indication is provided by dial-and-pointer-type indicator.

Magnetic coupling in unit provides drive action to transmit float-and-arm movement to indicator, with accuracy of ½%.

(Tank-contents gage is reviewed in Bul 833—The Liquidometer Corp., Long Island City 1, N.Y.)

Check 5621 opposite last pg.

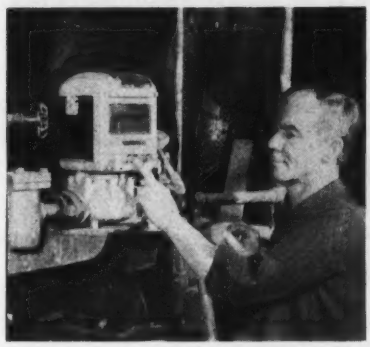
neptune

An advertisement written to help you

Measurement/Control News

prepared by Neptune Meter Company

Birge Wallpapers Use Liquid Meters to Get Fine Color Control



Color control in wallpapers made by The Birge Co., Inc., depends on adding accurate amounts of water to stains and pigments being ground in ball mills. Before changing over to automatic liquid meters, it took 20 minutes to feed 500 lb. of water by calibrated pails. Now it takes only 10 seconds of a man's time . . . the meters do the rest. Call Neptune for information.

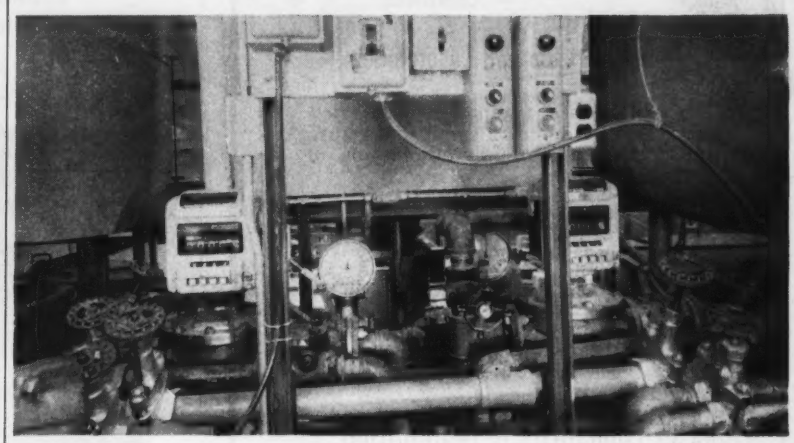
How to Select the Right Liquid Meters



How to save time, labor and ingredients *automatically* . . . how to get closer quality control and cost accounting . . . these involve selection of the *right* positive displacement meter with the *right* automatic features. You'll find help in Neptune's "tell how" bulletin. Lists liquids, rates of flow, selector charts, many features such as quantity control and ticket printing. Use coupon at right.

TO REDUCE HAZARDS of corrosive or inflammable liquids, keep them inside the pipes! Meters eliminate dangers of open tanks, dripping gauge sticks, measuring pails, etc. No more accidental contact with liquids or fumes . . . and you get accurate inventory figures, too. Neptune makes a wide range of meters for such applications. Send coupon at right.

10 Meters Formulate "Aerowax," "Black Flag"



"No other method combines such speed, quality control, cleanliness, economy, and morale," says Boyle-Midway

LOS ANGELES—In designing their new plant for "Aerowax" floor wax, "Black Flag" insecticides and other products, Boyle-Midway, Division of American Home Products decided to scrap the gauge stick, and put in ten meters to accurately control all liquid batching. Ranging in size from ¾" to 2", the meters proportion alcohol, "Ubatol", shellac, ammonia, isopropylaminoethanol, kerosene, oleic acid, water, and other ingredients.

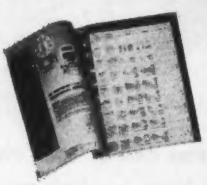
Most of the meters are automatic, eliminating human errors. Simply set them for the correct quantities by pressing keys, open the valves, and they will automatically stop the flow at the right point. Some have explosion-proof switches which control pumps or agitators.

Shown here are two 1,000-gal. "Aerowax" vats, with a close-up of the control station which has two 1½" Neptune Auto-Stop stainless steel meters and two ¾" Neptune bronze meters with round reading registers. All are of accurate, trouble-free disc piston type.

You too can benefit by talking over your plans with Neptune.

HELPFUL METERING DATA AVAILABLE

28-pg. technical bulletin lists liquids, helps pick proper sizes and features of meters 2 to 2000 gpm.



NEPTUNE METER COMPANY · Liquid Meter Division
47-25 34th St., Long Island City 1, N.Y.

☐ *Please send me helpful Meter Bulletin 566SP*
☐ *Send Meter Specification Guide 566B*

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____ CITY & STATE_____

Check 5622 opposite last page.

Automation on a budget

- Biological
- Microbiological
- Metallurgical
- Chemical

Process Plants and Laboratories

You can reduce manpower, cut rejections, eliminate human error, and return a higher yield through automation of routine processes.

We will evaluate your procedures and equipment, then submit an estimate that fits your needs and budget.

For a no-obligation engineering survey of your processes — production, pilot plant, laboratory, or analytical — write or phone today.

PROCESS EQUIPMENT & AUTOMATION, INC.

1414 EAST LINDEN AVE. LINDEN, N. J. WAbash 5-2626

Check 5623 opposite last page.

WARRICK

Floatless, Electrode Type

LIQUID LEVEL CONTROLS

give you all these advantages!



No moving parts in the liquid • Easy to install • No adjustments necessary • Unaffected by acids or caustics • Unaffected by pressure or temperature • Standard 2&3 pole units listed by U/L

Write for 32-page Catalog which gives complete specifications

Two pole control shown at left

YOU CAN USE OUR CONTROLS FOR:

- Single & multiple pumps
- Motor & solenoid valves
- High & low cutoffs & alarms
- Condensate contamination
- Storage tanks
- Volumetric Metering
- Waste sumps

Special controls to custom requirements

CHARLES F. WARRICK CO.

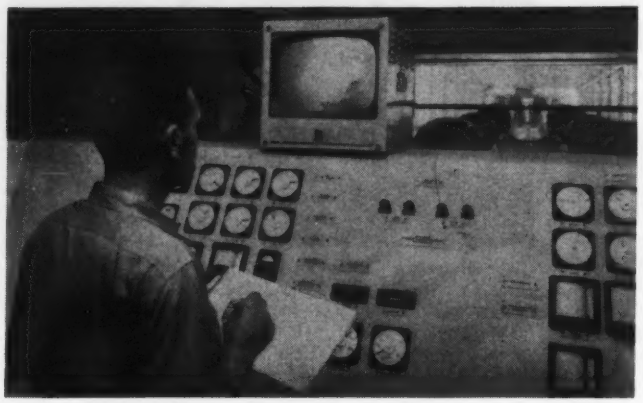
1964 W. Eleven Mile Road, Berkley, Michigan

Dep't 9 Telephone JOrdan 4-6667

Check 5624 opposite last page.

TV monitors kiln interiors; cement uniformity rises

System gives operator continuous look at material movement and other conditions in burning zones of two kilns . . . permitting quick adjustments



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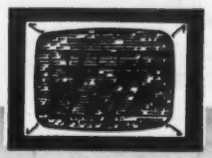
Closed-circuit-TV Hardware

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The viewing port assembly incorporates a heat-resisting glass plate covered with a special heat-reflecting coating and cooled by distributed air flow. Cool dry air at about 150 cfm is introduced into the air chamber of the viewing port through a three-inch inlet from a blower. At this point, the air is circulated over both sides of the glass window and allowed to escape to the kiln interior. A portion of the cooling air is simultaneously diverted through a ¾" line to cool the entire camera. Compressed air provides a standby source.

The monitors in the control room have 17" screens. They are connected to the camera units by coaxial cables. By adjusting monitor controls, the operator can vary picture contrast, brilliance, focus, and horizontal and vertical synchronization.



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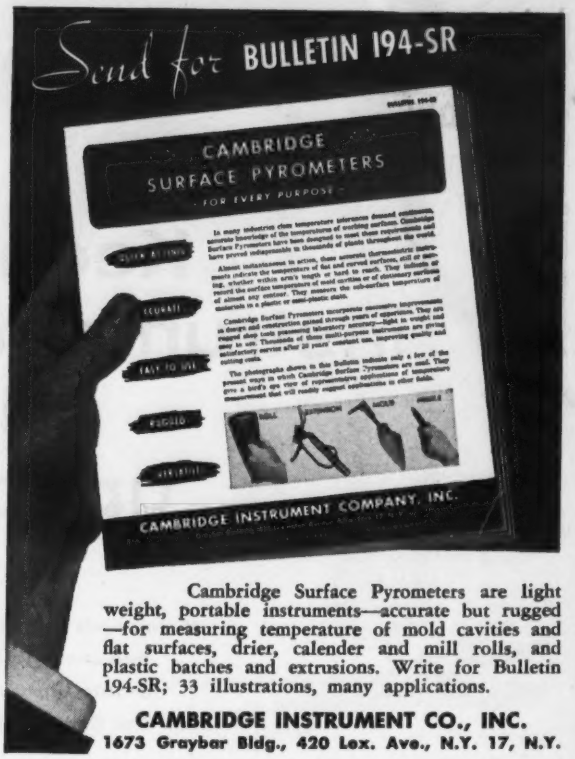
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Since the operator can scan the kiln interior from the "load line" (approximately 50 to 60′ from the firing end up to the point of clinker discharge), he can continually check on the flow of slurry and the formation of the clinker. The operator also can quickly spot any local overheating by noting the thickness of the coating forming on the refractory lining in the burning zone and by watching the size of the clinker as it falls.

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(Closed-circuit-TV system described here is development of Diamond Electronics, Division of Diamond Power Specialty Corporation, Lancaster, Ohio.)

Check 5625 opposite last page.



Cambridge Surface Pyrometers are light weight, portable instruments—accurate but rugged —for measuring temperature of mold cavities and flat surfaces, drier, calender and mill rolls, and plastic batches and extrusions. Write for Bulletin 194-SR; 33 illustrations, many applications.

CAMBRIDGE INSTRUMENT CO., INC.
1673 Graybar Bldg., 420 Lex. Ave., N.Y. 17, N.Y.

PIONEER MANUFACTURERS OF PRECISION INSTRUMENTS

Check 5626 opposite last page.

For Accurate TEMPERATURE RECORDS at MODERATE COST



Use TEMPSCRIBE Recorders

BULB-TYPE (illustrated) — *For recording temperatures at a distance*
BI-METAL TYPE — *For recording temperatures in surrounding air*

- Portable—easily carried. Can be set on flat surface or hung on wall.
- Spring-wound instrument-type clock: 3 standard movements—8 hours, 24 hours or 7 days.
- Instrument measures 4½" x 5½" x 7½"; uses 4¼" diameter charts.
- Chart graduations easy-to-read; spaced uniformly over full range.
- Pen and its actuating components are in door. Doors are completely interchangeable to convert to any temperature range, or from bi-metal type to bulb-type.

Also available: (1) Interchangeable door with electro-magnetic armature to record running time of motors, burners, solenoid valves, etc. (2) Two-pen doors for recording temperature and electrical operation on same chart.

Write for Leaflets 786 and 872

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200 N. BRADDOCK AVE. • PITTSBURGH 8, PA. T-25

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- Metallurgical
- Chemical

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You can reduce manpower, cut rejections, eliminate human error, and return a higher yield through automation of routine processes.

We will evaluate your procedures and equipment, then submit an estimate that fits your needs and budget.

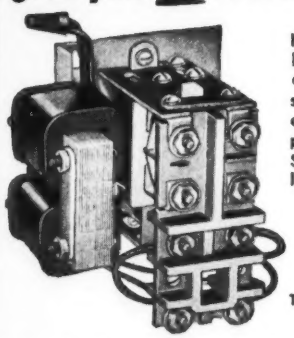
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YOU CAN USE OUR CONTROLS FOR:

- Single & multiple pumps
- Motor & solenoid valves
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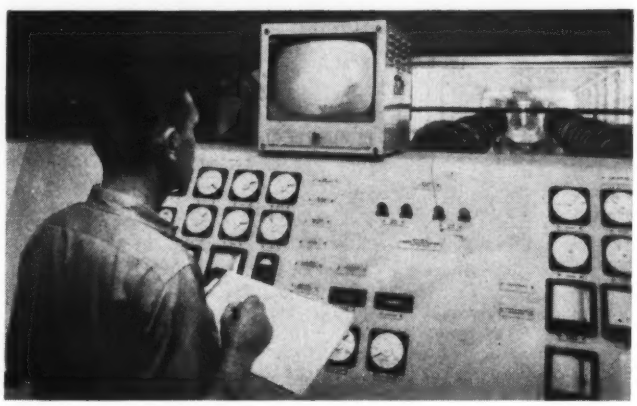
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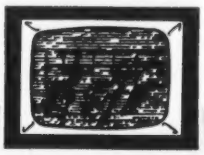
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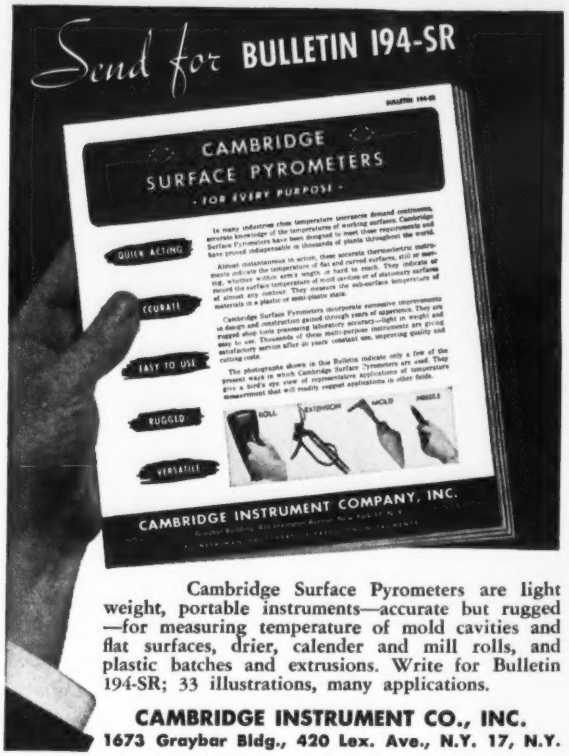
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Process Instrumentation and Control

Keep your instrumentation library up-to-date



If your job touches on any of the aspects of process instrumentation and control, then an important part of it is maintaining an up-to-date library of the latest catalogs, bulletins and brochures in the field. Look over this listing to see what you're missing . . .

Optical and physical test instruments are tabulated in 28-page bulletin picturing many of the instruments described. Instruments Bul—Gardner Laboratory Inc.

Check 5628 opposite last page.

Computer peripheral equipment is delineated in eight-page bulletin considering plug-in magnetic-tape units, high-speed buffer, high-speed paper-tape reader, high-speed paper-tape punch, card reader, digital graph recorder, analog-to-digital and digital-to-analog converters, high-speed line printers and battery power supply. Cat SP140—Packard Bell Computer, Subs. of Packard Bell Electronics.

Check 5629 opposite last page.



Viscosimeter handles measurements continuously over extended periods of time under controlled stresses and rates of shear. Unit is pictured and its rotational principle explained in eight-page Bul FS-217—Fisher Scientific Co.

Check 5630 opposite last page.

Electronic-resistance thermometer reads temperature directly from −100 to +900°C with ±0.25°C accuracy. It heads up list of instruments featured in 16-page bulletin, Labitems 10,2—The Emil Greiner Co.

Check 5631 opposite last page.

Spectrophotometers, Chromatographs, carbon-hydrogen analyzers, and a number of other instruments parade across the pages of 20-page Cat 59, Supplement 43—Scientific Glass Apparatus Co.

Check 5632 opposite last page.

Fluid-meter/proportioning-pump combination method, permitting given process to be continuous with all units synchronized and controlled from single source, is subject discussed in four-page bulletin explaining concept and giving necessary diagrams and engineering data. Bul 1400.20-1—B-I-F Industries.

Check 5633 opposite last page.

Finding end points by color change or by potential change is job of spectrophotometric and potentiometric titrators, detailed in eight-page bulletin including discussion of end-point selection by the derivative principle. Bul ST—E. H. Sargent & Co.

Check 5634 opposite last page.

Indicating temperature controls of high-temperature (to 1000°F) and compact short-range types are both featured on single sheet covering applications, construction features and control ranges. E36N Design Cat Sheet—United Electric Controls Company.

Check 5635 opposite last page.

Self-contained gages, for indication of draft, pressure, differential-gas pressure, and temperature and pneumatic impulses from transmitters, are presented in 12-page bulletin including clearance-dimensions drawings. Bul 321.11—Republic Flow Meters Company, Subsidiary of Rockwell Manufacturing Company.

Check 5636 opposite last page.

Instrument-panel design is considered in six-page brochure indicating various approaches possible. "Panel Discussion"—Falstrom Company.

Check 5637 opposite last page.



Digital-logging technique, for presenting measurement of physical variable, is discussed in four-page publication utilizing block diagrams to demonstrate how a physical property is measured, converted to electrical input and delivered in digital form. Product Data D400-2—Bristol Company.

Check 5638 opposite last page.

Moisture tester for granular materials is presented on single-sheet bulletin explaining operation. Commodity Moisture Tester Bul—Instrument and Apparatus Division, United States Testing Company.

Check 5639 opposite last page.

Satisfied with your process efficiency

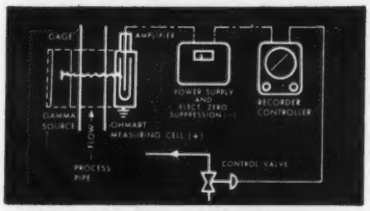
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Nuclear Gages for Process Measurement and Control!

Obtain continuous, close limit control of:

- **Specific gravity and density of liquids.**
- **Percent solids or moisture of slurries.**
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- **Dry solids flow (continuous weighing).**
- **Thickness or weight of moving webs of sheet materials.**



Typical Ohmart Density Control System where control of liquid density is by actuation of a valve. No part of the gage contacts the process material.

EXCLUSIVE OHMART ADVANTAGES: Ohmart gages have a precision and repeatability of ±2% of full scale or better, with ranges as narrow as 0.025 s.g.u. (4°Be., 5°Tw., 10°API, 5% solids) available. Ohmart systems operate with high signal-to-noise ratio; are unique in their stability and simplicity. Measuring cell has infinite life. Low-drift circuit requires only 5-minute semi-monthly standardization check. Rugged gage construction withstands severe atmospheric and mechanical conditions. Installation and maintenance costs are low. *Look to Ohmart to improve your process control. Performance to specification is guaranteed!* Write for literature.

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2230 Bogen St., Cincinnati 22, Ohio
Engineering Representatives in principal areas

Check 5640 opposite last page.

Rate control of temperature and distillation at a minimum cost with self-operated regulators is diagramed and described in six application guides, including dollar-saving hints on ways to eliminate pressure-reducing valves and increase water savings on typical regulator applications. Application Guides A12-14/18—Spence Engineering Company, Inc.

Check 5641 opposite last page.

Split-body control valves are looked at from all sides in 16-page bulletin, which includes a discussion of control-valve sizing and a listing of flow formulas. Bul LB-4—Conoflow Corporation.

Check 5642 opposite last page.

Strip-chart recorders for laboratory gas-chromatography applications are taken up in single-page data sheet discussion features and applications, in addition to specifications. Data Sheet E-ND46(9)—Leeds & Northrup Company.

Check 5643 opposite last page.

Glass-stem thermometers are reviewed in 32-page catalog which gives specifications and prices of thermometers, along with complete ASTM listings. Cat 620—Brooklyn Thermometer Company.

Check 5644 opposite last page.

A kaleidoscope of laboratory instruments is included in 200-page plastic-bound catalog, in which featured products are arranged by group classification. General Cat —Labline, Inc.

Check 5645 opposite last page.

Temperature regulators, available in self- or pilot-operated models from ¼" through 6" sizes, are presented with cutaway pictures, ratings, dimensions, applications and other data in Cat TCV-1 — OPW-Jordan Corporation.

Check 5646 opposite last page.

Gages for measuring, indicating, recording and controlling pressures and vacuum involved in industrial processes are described in 32-page Cat C70-1a — Industrial Division, Minneapolis-Honeywell Regulator Company.

Check 5647 opposite last page.

Over 250 instruments, counting systems, radionuclides, and nuclear accessories are presented in 96-page catalog, of which 48% is devoted to descriptions of products introduced in past two years. Cat S — Nuclear Chicago Corp.

Check 5648 opposite last page.



Ceramo®* Thermocouples will bend over backwards to fit your job!

All of us "Ceramo*-Couples" can bend to almost any configuration, and we don't break our skins, or lose insulation either! When they put us together, they did the job "right."

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THERMO ELECTRIC Co., Inc., Saddle Brook, New Jersey
In Canada: THERMO ELECTRIC (Canada) LTD., Brampton, Ont.

20 YEARS • *Temperature Measuring Systems and Components*

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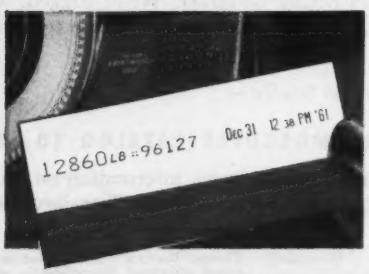
Why you should think of your scales as MONEY WEIGHING MACHINES

Cold, hard cash is the final value yardstick you must apply to every material or product that moves into, through, or out of your plant. How much does it cost? How much does it save? How much profit does it produce? In the last analysis, the answer always comes up in dollars and cents.

With dollars at stake, the *right* Toledo Scale at each weighing point is of the *utmost importance* . . . the backbone of control your needs demand. Your Toledo representative will take a personal interest in helping you get all the benefits provided by advanced Toledo methods and equipment. Write today. Toledo Scale, Division of Toledo Scale Corporation, Toledo 12, Ohio. *(Toledo Scale Company of Canada, Ltd., Windsor, Ontario.)*

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Prints where you wish on full 8½" x 11" forms, or on tickets or strips. Prints full figures, even when unit weights are used. Positive weight identification, with selective numbering, weight symbols, or consecutive numbering. Also prints time and date, if required. Weight data may be transmitted electrically to remote adding or other office machines. Ask for Bulletin 2017.

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Headquarters for Weighing Systems

Check 5650 opposite last page.

Mass flowmeters

From page 49

However, if your stream is extremely corrosive or abrasive or has a very high or low temperature, you may have trouble with the true-mass flowmeters. For, they all pass the stream through their internal mechanisms. Also, the idiosyncrasies of, and calibration techniques for, true-mass flowmeters are not nearly as well known in general as they are for the effective-mass flowmeters. (This is because of the effective-mass flowmeters are based on familiar components.)

Because of this very familiarity factor, you can easily determine from your own experience a good many of the inherent performance advantages and limitations of most of the effective-mass flowmeters. (eg, If you have had good results with a conventional volumetric magnetic flowmeter as opposed to other types because of the corrosive properties of the stream being measured, then you could reasonably expect a magnetic effective-mass flowmeter to do an equally satisfactory job for you.)

We have listed below the various manufacturers for the benefit of those interested in further pursuing the subject.

Avien, Incorporated, 58-15 Northern Blvd., Woodside 77, N.Y.

Check 5651 opposite last page.

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 26, Mo.

Check 5652 opposite last page.

Cox Instruments Division, George L. Nankervis Company, 15300 Fullerton Ave., Detroit 27, Mich.

Check 5653 opposite last page.

The Decker Corporation, 45 Monument Rd., Bala-Cynwyd, Pa.

Check 5654 opposite last page.

Fischer & Porter Co., 95 Warminster Rd., Warminster, Pa.

Check 5655 opposite last page.

For Sale

GOV'T. SURPLUS

PROPERTY

Naval Reserve Ordnance Plant DOD #473 and certain equipment located in Plant DOD #217. Plants located in Clark County, Nevada, north of the city of Henderson — approximately 19 miles southeast of Las Vegas.

SEALED BID
OPENING 3:00 PM
OCTOBER 15, 1961

Plants are currently being operated under government contract by American Potash & Chemical Corporation for production of Ammonium Perchlorate, a vital oxidizing agent used in solid propellant missiles.

★ PLANT DOD #473:

Consists of two parcels totaling 290.33 acres. Parcel #2 (138.9621 acres) contains all operating facilities for plant DOD #473. Parcel #1 was obtained for future expansion.

★ PLANT DOD #217:

Certain equipment owned and furnished by the Navy. Buildings (housing equipment) and property owned by American Potash & Chemical Corporation. Said company now operates both plants for the production of Ammonium Perchlorate.

CONDITIONS OF PURCHASE:

1. Purchaser of plant DOD #473 and equipment housed in plant DOD #217 may add the new construction and equipment necessary to continue production of Ammonium Perchlorate.
2. Sale of property and equipment is subject to 10-year National Security clause.
3. Purchaser must satisfactorily assure the Government of his ability to continue the production of Ammonium Perchlorate in quantity and quality sufficient to meet the Government's requirements.

Inspection by appointment only. Contact Resident Property Administrator, Bureau of Naval Weapons Representative, Department of Navy, Aerojet-General Corporation, 6352 North Irwindale Avenue, Azusa, Calif.

SEND FOR INVITATION, BID AND ACCEPTANCE FORMS NO. GSA-UDS-9-LB-2:

GENERAL SERVICES ADMINISTRATION

Utilization & Disposal Service
Business Service Center — Room 100
49 Fourth Street
San Francisco, California
Telephone: YUkon 6-3500 Ext. 3426

Check 6116 opposite last page.

The Foxboro Company, 38 Neponset Ave., Foxboro, Mass.

Check 5656 opposite last page.

General Electric Company, Instrument Dept., West Lynn, Mass.

Check 5657 opposite last page.

Gulton Industries, Inc., 212 Durham Ave., Metuchen, N.J.

Check 5658 opposite last page.

Hastings-Raydist, Incorporated, Hampton, Va.

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Industrial Nucleonics Corporation, 650 Ackerman Rd., Columbus 2, Ohio.

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Maxson Electronics Corporation, 475 10th Ave., New York 18, N. Y.

Check 5661 opposite last page.

National Instrument Laboratories, Inc., 862 Evarts St., N.E., Washington 18, D.C.

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The Ohmart Corporation, 2236 Bogen St., Cincinnati 22, Ohio.

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Pioneer-Central Division, The Bendix Corporation, 2710 Hickory Grove Rd., Davenport, Iowa.

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Potter Aeronautical Corporation, Route 22, Union, N.J.

Check 5665 opposite last page.

Revere Corporation of America, Subsidiary of Neptune Meter Co., Wallingford, Conn.

Check 5666 opposite last page.

Rotron Manufacturing Company, Incorporated, Hasbrouck Lane, Woodstock, N.Y.

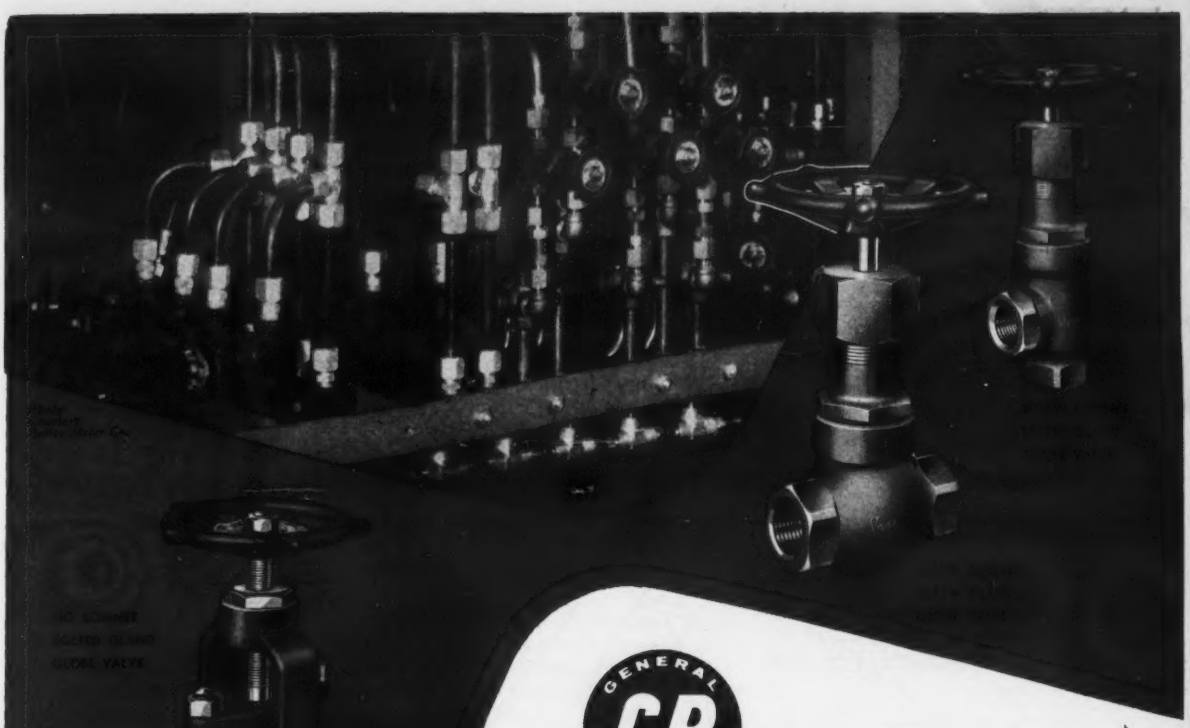
Check 5667 opposite last page.

Waugh Engineering Division, The Foxboro Company, 7842 Burnet Ave., Van Nuys, Calif.

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Pressure regulators — direct acting, reverse acting, and control valves — are cataloged and typical installation offered in Bul 116 — Manning, Maxwell & Moore, Inc.

Check 5669 opposite last page.





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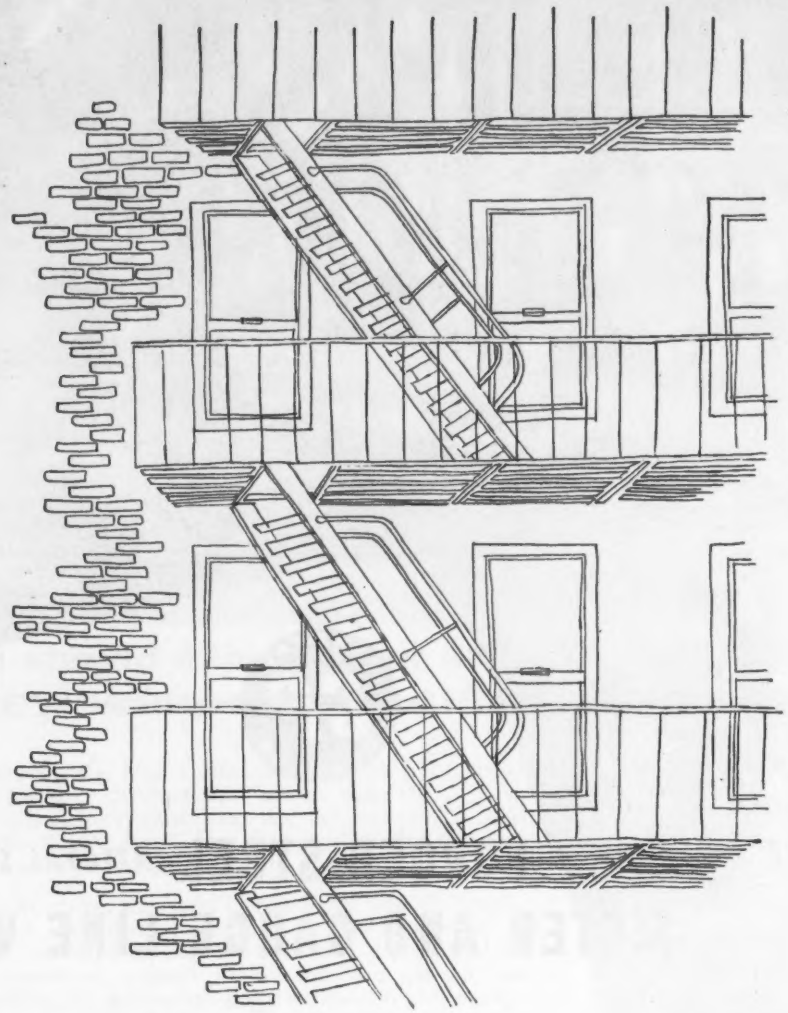
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Celanese CHEMICALS

Check 5671 opposite last page.

With density, viscosity, fluid calibration curves are calculated

Flowmeters are correlated based on Stokes' Law

A line of calibrated and correlated flowmeters is now available. The correlation is based on Stokes' Law. It permits calculation of a calibration curve for any fluid with known density and viscosity.

Each meter is individually calibrated and supplied with a curve for air and water. Special coordinates make this curve a straight line.

Tubes are constructed with plain taper and spherical glass



Based on Stokes' Law, flowmeter correlation permits calculation of calibrated ion curve for any fluid whose density and viscosity are known

floats. Larger sizes incorporate beaded tubes to eliminate high-flow-rate instability.

(Flowmeters are product of Roger Gilmont Instruments, Inc., One Great Neck Rd., Great Neck, N.Y.)

Check 5672 opposite last page.

Normally open, or closed —single valve will do

A line of pneumatically actuated diaphragm valves provides for on-off service and for limited throttling control.

By reversing the completely enclosed actuator spring assembly, universal-type actuator may be quickly changed from air-to-open to air-to-close service. Thus, only single valve is needed for normally open or normally closed service.

Valves are suited for saturated-steam service to 200 psig, and WOG service to 400 psig. They are available in size range of ¼ to 3″.

(Diaphragm valves are presented in Bul 98417—Taylor Instrument Companies, 95 Ames St., Rochester 1, N.Y.)

Check 5673 opposite last page.

Modified route to organophosphites opens new application avenues

Four compounds, in a growing family, are available in commercial quantities; others are in market development or research stage

INTEREST in phosphorus chemistry today is very high. It is at the same relative stage of development as silicone chemistry was 10 to 15 years ago and chlorine chemistry was 30 years ago.

Hooker Chemical's recent modification of the well-known transesterification route to organophosphites promises to give a good boost to commercialization of these products. Hooker is not telling much about the process, but does say that a key role is played by a "unique" catalyst, and that the new scheme is more flexible as to end products which can be produced and that high purities are assured.

The company, of course, is in a good basic raw material position with its present production of phosphorus trichloride and phenol. This, and its modified process, management points out, will permit it to offer the various organophosphites at attractive prices, thus widening interest in them.

Any available alcohol can be used in the versatile process, from methanol to the higher-molecular-weight monoalcohols and the polyols. Mercaptans are used in place of alcohols to produce thio-phosphate analogs.

Currently, Hooker's family of organophosphites is in three stages of development. A number of compounds is available in commercial quantities, another group in semi-commercial quantities and a third in research or pilot plant amounts.

Triphenyl phosphite, tridecyl phosphite, diphenyl-decyl phosphite and phenyldidecyl phosphite are available in commercial quantities. They are useful as stabilizer components or antioxidants in polyvinyls, polyacrylics, alkyd resins and synthetic rubbers. They are also used as additives to impart desirable properties to oil lubricants. In addition, triphenyl phosphite has found specific application as an epoxy-resin modifier.

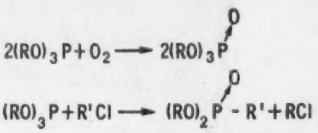
Compounds Also Perform As Intermediates

Potentially these compounds also have further use as intermediates in organophosphorus chemistry. Employed as phosphorylating agents, they lend fire-resistance to organic systems by the introduction of phosphorus, and also can be used to produce compositions which have applications in the resin and lubricant fields.

Investigations are being made to evaluate this group of chemicals to determine their further uses and to take advantage of the particular functionality of phenyl or decyl phosphites.

Tertiary phosphites undergo reactions with numerous organic and inorganic reagents to produce other organophosphorus compounds such as secondary phosphites, phosphates, thiophosphates, phosphonates, halogen-containing phosphonates and tertiary cyclic phosphites. Physical properties of these tertiary phosphites are illustrated in Table 1. All compounds are insoluble in water and soluble in ethanol, hexane, benzene and acetone.

Oxidation and isomerization reactions are shown below.



How tertiary phosphites are oxidized and isomerized

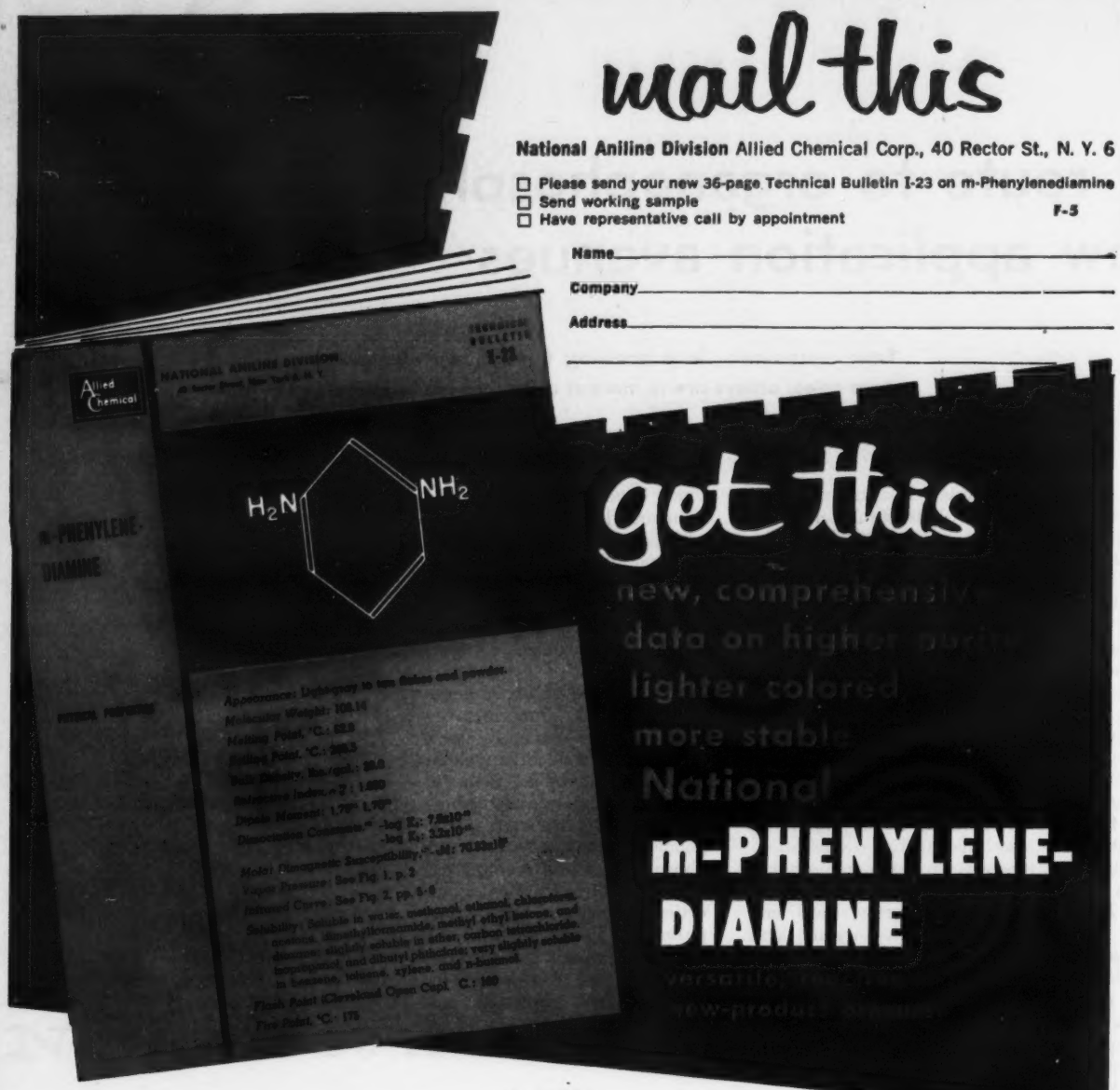
Among compounds now under market development are trimethyl phosphite, trilauryl trithiophosphite, diphenyl hydrogen phosphite, trioctyl phosphite, dioctyl hydrogen phosphite, tetra (diphenylphosphito) pentaerythritol (Pentite*), and diphenyl pentae-

To page 69

TABLE 1

Hooker's Commercially Available Organophosphites

	Triphenyl	Tridecyl	Diphenyldecyl	Phenyldidecyl
Formula	$(C_6H_5O)_3P$	$(C_{10}H_{21}O)_3P$	$(C_6H_5O)_2P-OC_{10}H_{21}$	$C_6H_5O-P(OC_{10}H_{21})_2$
Molecular Weight	310.28	502	374	438
Color and Form	water-white to pale yellow liquid	water-white liquid	nearly water-white liquid	nearly water-white liquid
Phosphorus Content, %	10.0	6.17	8.28	7.07
Melting Point, °C	22-25	<0	18	<0
Boiling Point at 0.1 mm, °C	180	155-160		
Refractive Index, n25/D	1.589	1.4560	1.5160	1.4785
Flash Point, COC, °F	425	455	425	425
Specific Gravity 25°/15.5°C	1.184	0.891	1.023	0.940
Viscosity (cs) — 100°F	8.34	11.24	7.82	8.95
210°F	2.07	2.90	2.26	2.42



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Check 5674 opposite last page.

For quick foam control in chemical processes, a defoaming trio

Quick acting defoaming agents will remove troublesome foam and chemical processes and industrial waste treatment systems. Series of three defoamers, designated 1840, 1841 and 1842, are designed respectively for use at high, normal and low temperatures. Agent 1842 may be stored and used in sub-zero weather.

Viscosity of defoamers is relatively uniform over considerable temperature range and dispersion throughout the system is immediate after feeding. Company reports that "slug" dosages of 10-30 ppm will extinguish and suppress foam in most applications for more than one hour. Continuous feeding of 0.5 to 1.0 ppm has proven effective in preventing further foam formation.

(Ionac defoamine agents 1840, 1841 and 1842 are products of Ionac Chemical Company, Division of Pfaudler Permutit, Incorporated, Birmingham, New Jersey.)

Check 5675 opposite last page.

Short exposure to 6000°F handled by polyamide modified phenolic

Uses: Resin was developed for use with glass cloth to produce laminates which will have an increased degree of burn-through resistance.

Features: Laminates resist ablation and have improved burn-through resistance when exposed for short periods of time to temperatures in excess of 6000°F.

Description: Polyamide modified phenolic resin has viscosity of 1000-2000 cps at 25°C. Specific gravity is 1.010-1.020 at 25°C. Solvent used is a 70:30 mixture of ethanol and water.

(Plyophen 23-057 resin is a product of Reichhold Chemical, Inc., RCI Building, White Plains, N.Y.)

Check 5676 opposite last page.

Modified route to organophosphites *From page 67*

rythritol diphosphite (Dipentite*). Some of these products are being investigated as phosphorylating agents as well as stabilizer components in polyacrylics, polyolefins and other high polymers.

One of the most interesting of the aforementioned products is trimethyl phosphite, for which a commercial-size plant is being built at the present time and which should be on stream by November 1961. Improvements in manufacture of this phosphite will permit its being offered in quantity at attractive prices, emphasizes Hooker. In addition, the product will be of high purity (97% min.), a condition which gives it and most other products made by this process better storage stability and more reliability in subsequent processing.

Trilauryl trithiophosphite has found application as a stabilizer in polyolefins, such as polypropylene, and also as a lubricant additive. The other compounds in this group are generally of interest as intermediates and as ingredients in stabilizer systems for resins.

*Hooker trade-mark

Commercial Dipentite has a relatively high melting point and for this reason has been used for introducing a tertiary phosphite in solid-state stabilizer systems, when material handling problems dictate that such a system be used.

Table 2 shows physical properties of these seven materials. Trimethyl, diphenyl, trioctyl, dioctyl, Pentite and Dipentite are insoluble in water and soluble in ethanol, benzene and acetone. Trimethyl, trioctyl, dioctyl and Pentite are soluble in hexane, while diphenyl is insoluble and Dipentite slightly soluble in this solvent. Trilauryl trithio is insoluble in water and acetone, soluble in benzene, petroleum ether, cyclohexane and diethyl ether.

Additional Varieties Being Researched

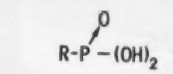
A wide variety of additional organophosphites is currently of interest in the research stage of development. Considerable interest is being shown in triallyl phosphate. A good grade has not been readily obtainable by the phosphorus oxychloride, allyl alcohol route. Now, however, through this novel route triallyl phosphite first can be prepared, and this can then be oxidized to triallyl phosphate. Although Hooker considers triallyl phosphite and phosphate in the "research" category, both are available in sufficient quantities for developmental testing, having a potential commercial price of $1 a pound.

Triallyl phosphate is of interest as a polymerizable monomer and co-monomer for polymer, textile and paper product applications. Of interest also are the trimethallyl phosphite and trimethallyl phosphate for similar applications.

Other tertiary organophosphites of considerable research interest are triethyl, tributyl and trilauryl phosphite. Research samples of many of these are available.

The isomerization of trialkyl phosphites to the diakyl alkylphosphonates is also receiving a considerable amount of attention. The phosphonates are characterized by increased thermal and hydrolytic stability and have other properties indicating usefulness in a wide variety of applications.

At present, dimethyl methylphosphonate and diamyl amylphosphonate are of most interest, with diallyl allylphosphonate receiving some attention. In addition, the alkylphosphonates provide a probable economical route to the alkylphosphonic acids:



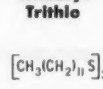
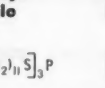
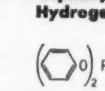
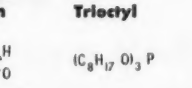
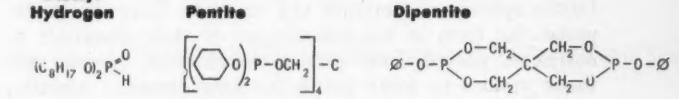
a class of compounds which possesses many interesting properties.

(Organophosphites are products of the Hooker Chemical Corporation, Buffalo Avenue at 47th Street, Niagara Falls, New York.)

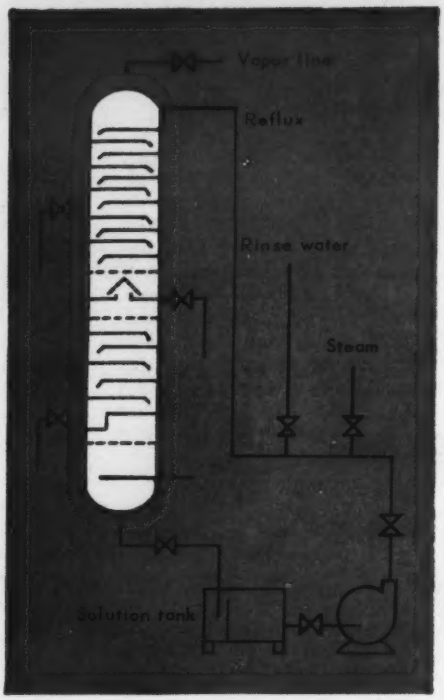
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TABLE 2

Hooker Organophosphites Under Market Development

	Trimethyl	Trilauryl Trithio	Diphenyl Hydrogen	Trioctyl	Dioctyl Hydrogen	Pentite	Dipentite
Formula							
Molecular Weight	124.1	634	234	418	306	1000	000
Color and Form	water-white liquid	water-white to very slightly yellow liquid	clear straw-colored liquid	clear light-straw-colored liquid	clear straw-colored liquid	white waxy solid	white powder
Phosphorus Content, %	25	4.9	12.8	7.45	9.9	12.4	16.3
Melting Point, °C	FP <−75	15	last crystal point, 12	glassy at low temperatures	glassy at low temperatures	30-60	114
Boiling Point, °C	110-112		100/0.05 mm	100/0.01 mm (est)	100/0.05 mm (est)		190-200/0.1 mm
Refractive Index, n25/D	1.401	1.4988	1.5566	1.4507	1.4440	1.5823	solid
Flash Point, COC, °F	100	398	350	340	320		
Specific Gravity 25°/15.5°C	1.0449	0.9160	1.2208	0.8967	0.934		
Viscosity — 68°F			15.90 cp	8.5 cp	7.40 cp		
100°F		24.7 cs	8.47 cp	5.03 cp			
160°F		9.8 cs					
210°F		5.7 cs			4.40 cp		

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CHEMICAL MATERIALS

MEK peroxides speed polyester cures and gels

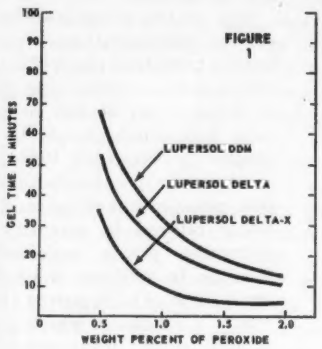
Uses: Compound has been developed to be useful for low temperature polymerization of polyester resins.

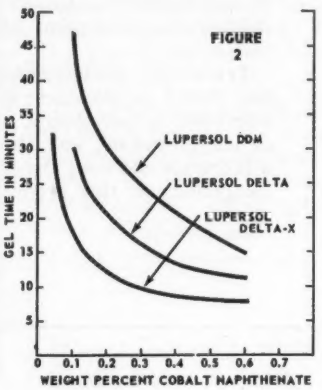
Features: Lupersol® Delta-X provides faster gel and cure times at low temperatures as compared with the company's other methyl-ethyl-ketone peroxides.

Description: Material is a clear, colorless solution of methyl-ethyl-ketone peroxides and hydroperoxides in dimethyl phthalate and contains 60% as $C_8H_{16}O_4$ with 11% active oxygen.

Fig 1 compares this form of peroxide with the company's other products in a basic polyester resin containing 0.2% cobalt naphthenate.

Increased activity of the new material can be seen in Fig. 2 showing that cobalt concentrations of more than 0.2% have only a slight effect on gel times whereas a change of 0.2% to 0.07% cobalt will almost double the gel time. These data show that this compound does not require as much cobalt accelerator as





PHYSICAL PROPERTIES

Form	Liquid
Color	Water-white
Specific Gravity @ 25°C	1.086 min
Refractive Index @ 25°C	1.4426 min
Flash Point (Micro Open Cup)	Above 176°F (80°C)
Decomposition (Rapid Heat Test)	Mildly @ 284°F (140°C)
Viscosity @ 25°C (77°F)	8.64 cp
@ 30°C (86°F)	6.93 cp

Solubility @ 20°C (Weight Percent):

Insoluble (<1%) — water, glycerine, petroleum ether, cyclohexane, mineral oil, hydrocarbons

Slightly Soluble (1-5%) — tricresyl phosphate, dibutyl phthalate, dioctyl sebacate

Soluble (15-50%) — butyl acetate

Very Soluble (>50%) — alcohols, methyl ethyl ketone, ethers, ethyl acetate, dimethyl phthalate

other catalysts. Extended shelf life of the polyester resin will result.

The product shows exceptional ability to polymerize auto-body putties at low temperatures.

A check of a typical putty with the "Hardner" supplied against the new material at 77°F and 46°F, shows that only 0.5% of the new product is required. This is half the amount required for the other material to obtain equivalent gel times.

Lupersol Delta-X shows considerable increase in activity over the company's other methyl-ethyl-ketone peroxides when used in isophthalic polyesters.

(Lupersol Delta-X is a product of the Lucidol Division, Wallace & Tiernan Incorporated, 1740 Military Road, Buffalo 5, New York.)

Check 5679 opposite last page.

Polymer gives high gloss and adhesion to inks and polishes

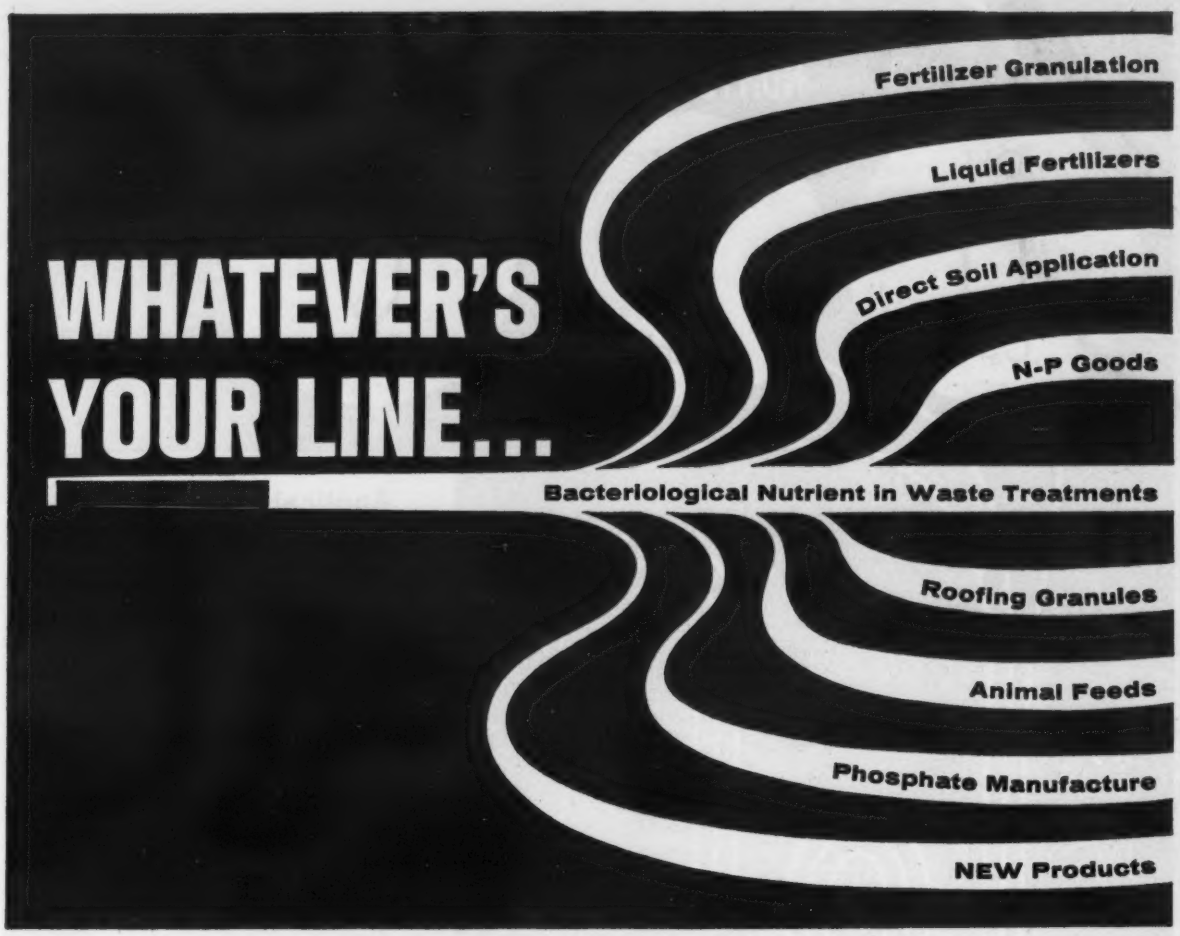
Uses: Resin should find use in flexographic and glycol-soluble inks, overprint lacquers, polymer-type emulsion polishes and paints.

Features: Highly polar resin permits good solubility in alcohol, aqueous ammonia, esters, ketones and aromatic hydrocarbons. It shows a broad compatibility with nitrocellulose, ethyl cellulose and zein.

Description: Polymeric product, Pentalyn 255, is hard and somewhat friable at room temperature with a high softening point (175°C). It exhibits broad compatibility with polystyrene, acrylic, PVA, polyethylene and copolymer emulsions used in polishes. It contributes demonstrable gloss, adhesion and hardness characteristics, all considered to be desirable.

(Pentalyn 255 resin is a product of Hercules Powder Company, Hercules Tower, 910 Market St., Wilmington 99, Del.)

Check 5680 opposite last page.



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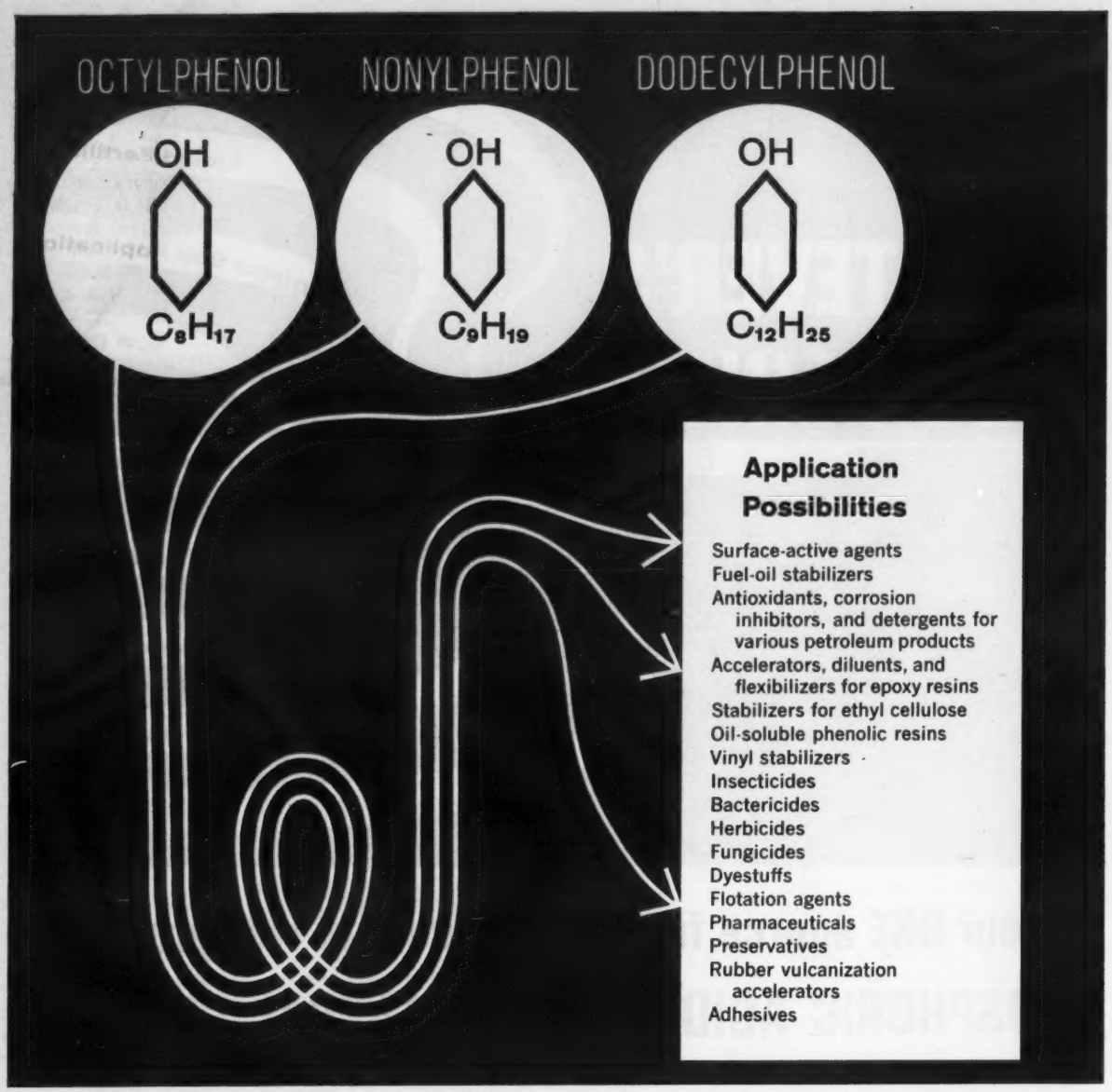
Take advantage of the savings this higher quality phosphoric can bring you!

Every user of phosphoric acid is invited to check with General Chemical for present supply or future requirements. Call or write your nearest General Chemical office for samples, information, and prices.

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Check 5681 opposite last page.



Low-price intermediates for many products

Productive reactivity and low price make Rohm & Haas alkylphenols valuable intermediates for many products. These alkylphenols undergo the normal reactions of the phenolic hydroxy group and nuclear substitution of the benzene ring. Useful reactions include etherification with ethylene oxide, condensation with aldehydes and sulfur halides, preparation of phosphorus esters, reaction with aldehydes and amines to give Mannich bases, sulfonation, halogenation and nitration. Rohm & Haas alkylphenols can be shipped in packages and in bulk quantities.

Write to Dept. SP-19 for samples and an 18-page booklet on reactions, uses, physical properties.



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ALKYLPHENOLS

Check 5682 opposite last page.

Thermoplastic resin exhibits elasticity without plasticizer

Uses: Resin can be used alone for molded or extruded goods, filled with low-cost materials or blended with other substances to improve properties.

Features: Polymer has properties related to low-density polyethylene, plasticized vinyl and rubber. Unusual flexibility and elasticity are obtained without the use of a plasticizer.

Description: Thermoplastic resin, Poly-Eze, resembles



Flexibility and elasticity are achieved without use of plasticizer

low-density polyethylene in physical properties but has improved flexibility, impact strength and resistance to stress cracking. Low-cost filling materials can be used in quantities up to 90%. Resin can be "loaded" up to 50% without affecting its tensile or elongation properties.

Extruded film has excellent hand because of its combination of limpness and flexibility. It has printed well in preliminary evaluation. Resin possesses a broad processing range and is readily handled in conventional processing equipment. Density is 0.932 and melt index 2.

(Poly-Eze thermoplastic resin is a product of Spencer Chemical Company, Dwight Building, Kansas City 5, Mo.)

Check 5683 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

THAT'S INTERESTING

Sign of life in space

Evidence that life forms exist outside this planet has been uncovered by a team of Esso Research and Engineering Co. and Fordham University scientists.

Analyzing pieces of a 97-yr-old meteorite, the team found indications of paraffinic hydrocarbons in the meteorite. Such paraffins contain from 19 to 23 carbon atoms and are similar to molecules found in the skin of grapes and apples. They are produced only by living matter.

Advanced analytical techniques made the discovery possible.

Job value

What is a job worth? Shell Oil Company has $88,000 invested in plant, equipment, etc. for each employe.

For more information on product at right, specify 5684 see information request blank opposite last page.

SALES MAKING ADDITIVES FOR PLASTICS

Cyanamid additives for plastics can mean longer life, better wear, less discoloration, minimal brittleness. Or they can mean static-free products—no accumulating dust or lint. Today—they are stimulating growth of new uses and markets for plastics. • Cyanamid additives will surely bring new sales advantages to your products, greater satisfaction to your customers, more profits for you. If you'd like to see how Cyanamid research and experience can help you—a letter or phone call to us will start things moving. No obligation. Contact Cyanamid today! • American Cyanamid Company / Intermediates Dept. / Bound Brook, N.J.

Among Cyanamid's additives for the plastics industry: • *Cyasorb® Light Absorbers:* Screen out damaging ultra-violet light in vinyls, lacquers and varnishes, reinforced polyesters, laminated safety glass, and other materials. • *Antioxidants:* Minimizes brittleness, discoloration, cracking, in end uses. • *Antistatics:* Greatly reduce static electricity accumulation and keep finished products lint-free, dust-free, more saleable.



HOW *HERCULES* HELPS...



MAKE MINK COATS—Minks require a high fat content diet to make their pelts luxuriously lovely jackets and stoles. To keep mink food from becoming rancid, Dalpac® antioxidant (BHT) made by Hercules is incorporated in the formula, thus assuring a proper diet. Besides this unusual use, Dalpac is an important ingredient in other animal and poultry feeds as well as in materials such as plastics, rubber, vitamins, resins, and gums.



PRESERVE RECORDS FOR LIFE—Paper parchment is now being used by many leading universities in place of tanned sheep hide for diplomas. The paper parchment endures longer and is less expensive initially than sheepskin. Parchment paper for this use . . . and many others where "permanent" paper is required . . . can best be sized with Aquapel®, a synthetic sizing agent resulting from Hercules' search for new chemicals for the paper industry.

HERCULES POWDER COMPANY
INCORPORATED
Hercules Tower, 910 Market Street, Wilmington 99, Delaware

CHEMICAL MATERIALS FOR INDUSTRY

HERCULES

G61-S

Check 5685 opposite last page.

Add reactive amine group to polymers by using acrylic monomers

Provide dye anchoring sites and improve adhesion

Uses: Compounds provide a means of introducing pendant, reactive amine groups into plastics, elastomers, coatings and fibers. They may also be useful chemical intermediates since amine groups and double bonds can enter into a wide variety of reactions.

Features: Amine functional group permits preparation of copolymers which have improved adhesion to a large number of substrates and which provide anchoring sites for dyes and pigments. They can be used in preparing thermosetting acrylic coatings.

Description: Readily polymerizable acrylic monomers, dimethylaminoethyl methacrylate (DMAEMA) and tert-butyl-aminoethyl methacrylate (t-BAEMA), are now available in commercial quantities. In addition to polymer use DMAEMA can be readily quaternized in a manner similar to other tertiary amines. Both compounds can be used to produce water-soluble and acid-soluble copolymers.

(Methacrylate monomers DMAEMA and t-BAEMA are products of Rohm & Haas Company, Washington Square, Philadelphia 5, Pa.)

Check 5686 opposite last page.

Low toxicity offered by glycol ether solvent duo

Uses: Compounds should make attractive solvents, humectants and preservatives in food and cosmetic industries.

Features: Solvents combine excellent coupling and solvent properties of glycol-ethers with low toxicological properties of propylene glycol.

Description: Glycol-ether solvents, Ucar LM (propylene glycol methyl ether) and 2LM (dipropylene glycol methyl ether), are propylene glycol

Dow Corning SILICONE DEFOAMERS



CHOP OPERATION COSTS

Most effective. Dow Corning silicone defoamers are best for banishing space-filling, time-eating foam in the processing of any foamer . . . from asphalt to beans to peas to zeins. Dow Corning Silicones start quicker, last longer. Eliminate messy and unsanitary foam-overs. Turn maintenance into production time.

Most efficient. Even the most violent foamers are tranquilized with a tiny amount of a Dow Corning silicone defoamer — often one part silicone solids per 10 million parts foamer is effective. For true economy, change to a Dow Corning antifoamer or defoamer. There's one just right for your product and system — oil, aqueous or food.

FREE SAMPLE

Send today for a generous trial sample and full data. Please specify type of system. Address Dow Corning Corporation, Midland, Michigan, Dept. 2721.

first in silicones **Dow Corning**

Check 5687 opposite last page.

analogues of methyl Cellosolve and methyl Carbitol. Prices in eastern territory are $0.185 in tank car lots of solvent LM and $0.195 for solvent 2LM. Less than car load quantities and prices in western territories are slightly higher.

(Ucar solvent LM and 2LM are products of Union Carbide Chemicals Company, Div. of Union Carbide Corporation, 270 Park Ave., New York, New York.)

Check 5688 opposite last page.

Reactive intermediates derived from butadiene

Two reactive intermediates have been made available in research quantities. Products are butadiene-derived hydrocarbons.

1,3-cyclooctadiene has conjugated double bonds which give it unusual reactivity. It should prove useful in the manufacture of coatings, adhesives and reinforced plastic.

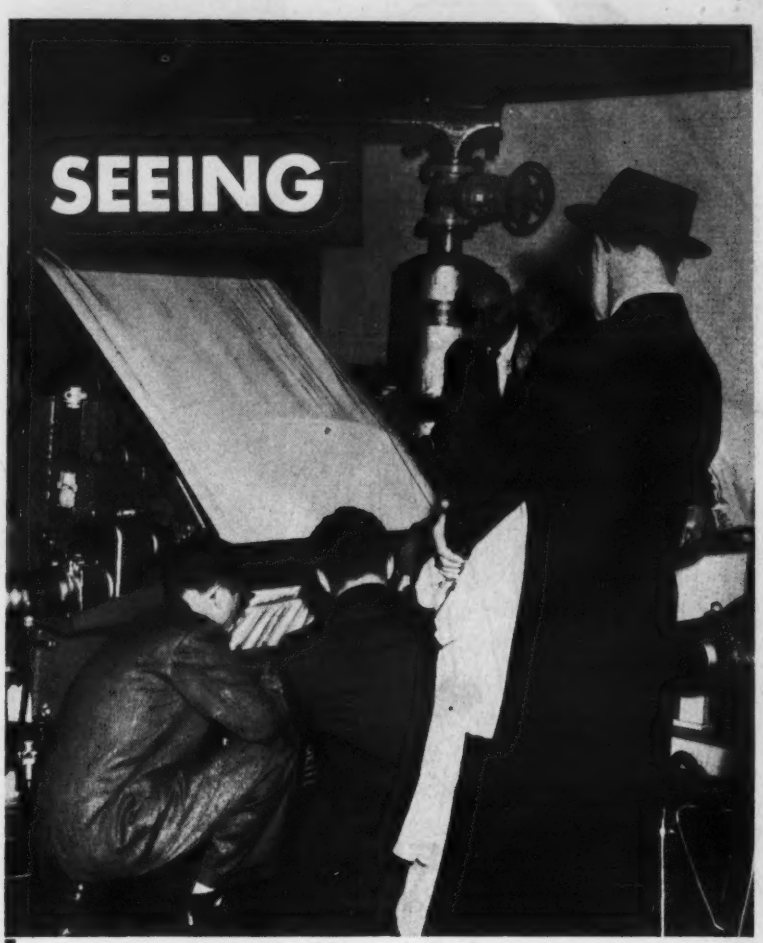
1,5,9-cyclododecatriene is predominately all trans isomer made by the cyclic trimerization of butadiene. It can be used to produce a wide variety of di- and trifunctional twelve carbon chemicals, including 12-aminododecanoic acid. This product can be converted to a polyamide resin.

(Butadiene-derived intermediates are products of Cities Service Company, 60 Wall St., New York, New York.)

Check 5689 opposite last page.



"Of course it's an A.S.T.M. method."



is the best answer

There is no quicker and better way to learn of new developments – to compare their relative merits–to get new ideas that may cut costs and improve your products – than to actually SEE what's new at the Exposition of Chemical Industries.

Your limited time will be well spent in studying the fact-filled displays of over 500 leading manufacturers of process equipment, materials handling, chemicals and raw materials, laboratory equipment and supplies, control instruments and automation.

Keep informed–plan your visit now, and bring your associates with you. It will more than pay you for the modest investment in time. Write for free advance registration. 2779

Check 5690 opposite last page.



EXPERIENCE

that should carry a lot of weight with you

Lucidol has accumulated 35 years of experience in the development of organic peroxides and their compounds. Our products are distinguished by their quality and uniformity. Our fund of technical knowledge is at your disposal. Remember these facts when you seek a solution to processing problems involving the following peroxide groups:

Diacyl Peroxides • Dibasic Acid Peroxides • Ketone Peroxides • Aldehyde Peroxides • Alkyl Peroxyesters Alkyl Peroxides and Hydroperoxides Diperoxide Derivatives

Write for Data Sheets or See
CHEMICAL MATERIALS CATALOG, Page 178

LUCIDOL DIVISION

WALLACE & TIERNAN INC.
1740 MILITARY ROAD
BUFFALO 5, NEW YORK

Check 5691 opposite last page.

Octet of polyolefins debut for molding and extruding

Ethylene polymer parade exhibits variety of uses

A series of eight linear polyolefin resins for injection molding, blow molding and extrusion has been introduced.

High density polyethylenes R600, R800 and R810 are designed for injection molding and extrusion applications that require materials with good flow properties. R600 is recommended for moldability and toughness; R800 for mold fill rigidity and impact strength; and R810 designed for good load bearing properties.

High density polyethylenes R211 and R401 are resins designed specifically for blow molded container industry. R211 resists stress cracking and has good rigidity. R401 is an ethylene homopolymer, can be used where stress resistance is not of prime importance.

Polyethylenes R200, R210 and R300 are general purpose resins suited for both blow molding and extrusion applications. R200 and R300 are ethylene homopolymers recommended for rigid containers and fabrication into sheet and monofilaments. R210 is a copolymer possessing excellent stress crack resistance and good impact strength.

(Polyethylenes R200, R210, R211, R300, R401, R600, R800 and R810 are products of Dow Chemical Co., Midland, Mich.)

Check 5692 opposite last page.

Processing aid for PVC disperses more easily, promotes faster mixing

Uses: Product is designed for modification of polyvinyl chloride to improve processing characteristics. It can be used for unplasticized PVC, semi-rigid and flexible formulations.

Features: This improved form of a product introduced five years ago, has more uniform particle size. Consequently, it disperses more easily. On the mill, acrylic modifier promotes a smooth bank and faster mixing.

Description: Acryloid K-120N, acrylic modifier fluxes easily in PVC over the range of processing temperatures used for various grades. Resin is completely compatible with all grades of unplasticized vinyl in common use. It is most frequently used in concentrations equivalent to five to 10 percent replacement of vinyl resin.

In most operations, modifier permits lower processing temperatures and time required to rework scrap is cut to a minimum. In calendering, manufacturer reports that modifier permits faster machine speeds, gives better surface qualities and roll release. In vacuum forming, flow of hot sheet into the mold is improved.

(Acryloid K-120N is a product of Rohm & Haas Company, Washington Square, Philadelphia 5, Pa.)

Check 5693 opposite last page.

Liquid polyamide resins used as curing agents for epoxy systems

Uses: As curing agents for epoxy systems used in coating, tooling and adhesive application.

Features: Blends of polyamide and epoxy resins, when cured, possess flexibility; exceptional adhesion; high mechanical strength; excellent resistance to solvents, chemicals and water; and ease of handling.

Description: Liquid polyamide resins are produced by condensation of polymerized fatty acids and suitable polyamino compounds. Two are now commercially available: Pentamid 1, with a viscosity of 30-50 poises at 75°C; and Pentamid 2, with a viscosity of 8-13 poises at 75°C.

(Pentamid 1 and Pentamid 2 are products of Specialty Chemicals Department, Heyden Chemical Division, Heyden Newport Chemical Corporation, 342 Madison Ave., New York 17, N.Y.)

Check 5694 opposite last page.

THAT'S INTERESTING

Automating the lab

A Shell Development company scientist is hoping that radiation equipment may do for the lab what bookkeeping machines have done for the office.

Shell plans to couple a particle accelerator, which can make some of nature's building blocks identify themselves radioactively, to an instrument for interpreting such signals.

This will give the lab a quick way to identify elements.

Sr-90 taken from milk

A pilot plant is removing strontium 90 from milk at the USDA research center at Beltsville, Md.

Studies have shown that if milk is treated with dilute citric acid, then passed through ion-exchange columns, 98% of the Sr-90 present can be removed.

For more information on product at right, specify 5695 see information request blank opposite last page



ORONITE

WHEN THERE WAS NEED FOR AN ADVANCED PRODUCT!

The problem: To help projected manned aircraft and missiles break through the "heat barrier" during hypersonic flight. Hydraulic fluids, which would perform under extreme conditions, were needed to control operation of guidance and weapons systems.

The solution: Oronite developed High Temperature Hydraulic Fluids for the U. S. Air Force and aircraft industry. These fluids perform at temperature ranges of from −65° to +520° F, at pressures exceeding 4000 psi.

Substantial research and cooperative technical service programs are essential to success in developing new, advanced products.

You will find Oronite capable and willing to participate in other major product development programs—to help your company be "first with the future."

Where chemical raw materials are born and produced in volume

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FOREIGN AFFILIATE • California Chemical International, Inc., San Francisco, Geneva, Panama, Sao Paulo

7033

SILICONE NEWS from Dow Corning

Cut foam production costs



Make better foams consistently with Dow Corning Silicones

Especially developed for use in polyurethanes, a series of Dow Corning Silicones help you make uniform foam easily, more economically, and more consistently. Here's how.

Greater efficiency. Dow Corning silicone additives are effective at lower concentrations. In most cases, as much as 25% less is required to produce uniform cell structure, high quality foam.

Greater dependability. Dow Corning silicone additives help assure consistent uniformity. Dow Corning 113 for rigid foams, for example, produces fine quality foam products even after long term standing—alone or as a package premix with prepolymers, resins, flame retardants, viscosity and control stabilizers. Also stable with amines and crude isocyanates, Dow Corning 113 makes possible production of good quality foam from crude isocyanates.

Whether you make flexible polyurethane foam or rigid — one shot or prepolymer — Dow Corning silicone additives take the guesswork out of



production. They perform identically each time, yield better quality products . . . aid you in making repeat sales. They help you improve profits by keeping production control and material costs low.

For prompt assistance and complete data, write Dow Corning Corporation, Midland, Michigan, Dept. 2721a.

first in silicones

Dow Corning

Check 5696 opposite last page.

Tungsten hexafluoride offered in quantity at high purity

Commercial quantities of high purity tungsten hexafluoride are available for the first time. Compound is tungsten source for vapor deposition technique which permits tungsten to assume vital industrial roles. Tungsten coatings can now be applied simply and economically to complex shapes.

Processing equipment and pipe with extraordinary resistance to wear and corrosion should be possible.

Object to be coated is placed in a non-porous ceramic cylinder and a hydrogen atmosphere introduced. Object's temperature is raised to above 900°F. Tungsten hexafluoride and an excess of hydrogen are introduced. As this mixture comes in contact with heated object, tungsten plates out on the surface. Coatings can be deposited at rates up to 1 mil per minute, without pores or roughness. Purity of coatings is 99.99+%.

(Tungsten hexafluoride is a product of General Chemical Division, Allied Chemical Corporation, 61 Broadway, New York 6, N.Y.)

Check 5697 opposite last page.

Provide water repellency without catalysis or thermal cure

Uses: Products provide a water repellent surface for paper, textiles and leather.

Features: Aid-drying silicone water repellents are durable, provide excellent water repellency without catalysis or thermal cure.

Description: Two products are offered: SS-4029 (50% mineral spirits) for consumer applications, particularly for pressure packaging; SS-4053 (50% perchloroethylene) for industrial application where material containing a non-flammable solvent is needed.

Both materials can be applied by spray, brush and swabbing, dip coating and roll coating. They provide unim-

paired air circulation, improved low temperature flexibility, increased resistance to oils and greases, waterborne spot and stain resistance and rapid air drying.

(Water repellents SS-4029 and SS-4053 are products of Silicone Products Dept., General Electric Co., Waterford, N. Y.)

Check 5698 opposite last page.

Urethane-alkyd vehicles in solvent solution

Polyurethane alkyds and coating resins have been compounded to produce solvent solution coatings. The "U" series are offered as vehicles for protective coatings. U-1000 series offers excellent properties for exterior coatings, floors and masonry. It is a solvent solution of a one-can stable polyurethane modified alkyd resin, furnished at 60% solids in mineral spirits.

U-2000 series has extreme chemical resistant properties. This series has a solvent solution of one-can moisture curing polyurethane coating. Resin is furnished at 60% solids in cellosolve acetate-xylol and is oil free.

(U-series vehicles are products of Commercial Resins Corporation, 1250 W. 7th St., St. Paul 2, Minn.)

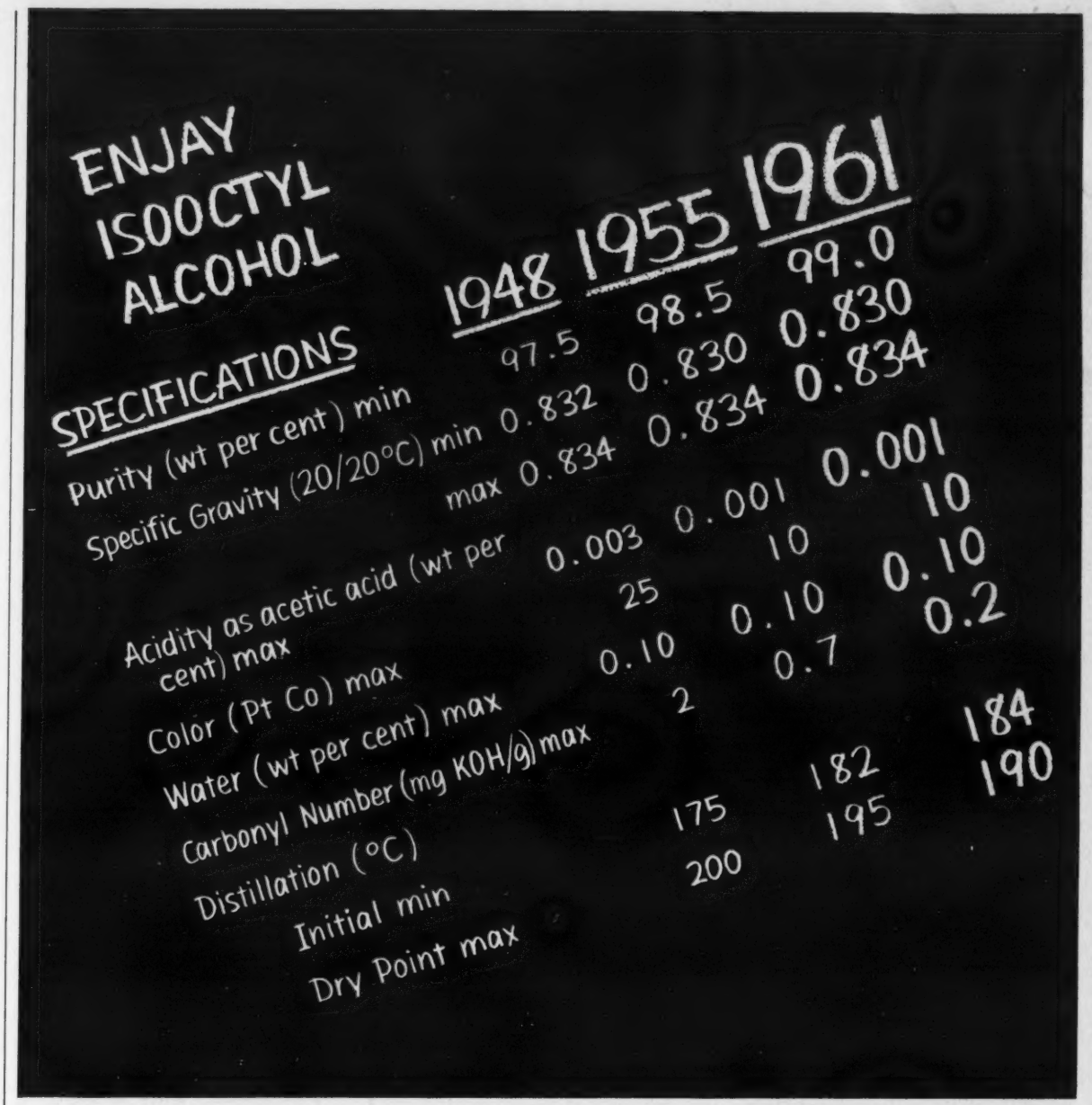
Check 5699 opposite last page.

Flexible graphite cloth tripled in strength

Continuing research and development on graphite cloth has tripled the strength and doubled flexibility, according to manufacturer. Modification of processing techniques used to convert organic fibers to essentially pure graphite has increased previous 8-lb average breaking strength of material to 25 lb (see CHEMICAL PROCESSING, July 1959, page 52).

(Graphite cloth is a product of National Carbon Company Division of Union Carbide Corp., 270 Park Ave., N.Y. 17, New York.)

Check 5700 opposite last page.



Product improvement never stops at Enjay

Enjay first introduced isooctyl alcohol in 1948 with the specifications shown above. Since that time this higher oxo alcohol has been constantly improved. A comparison of the 1948, 1955, and the 1961 specifications will provide a clear indication of this continuing improvement.

Whatever your needs, you'll find Enjay a dependable source of supply of quality chemicals delivered promptly from convenient supply points. For specifications and typical properties of any Enjay product, write to us at 15 West 51st Street, New York 19, New York.

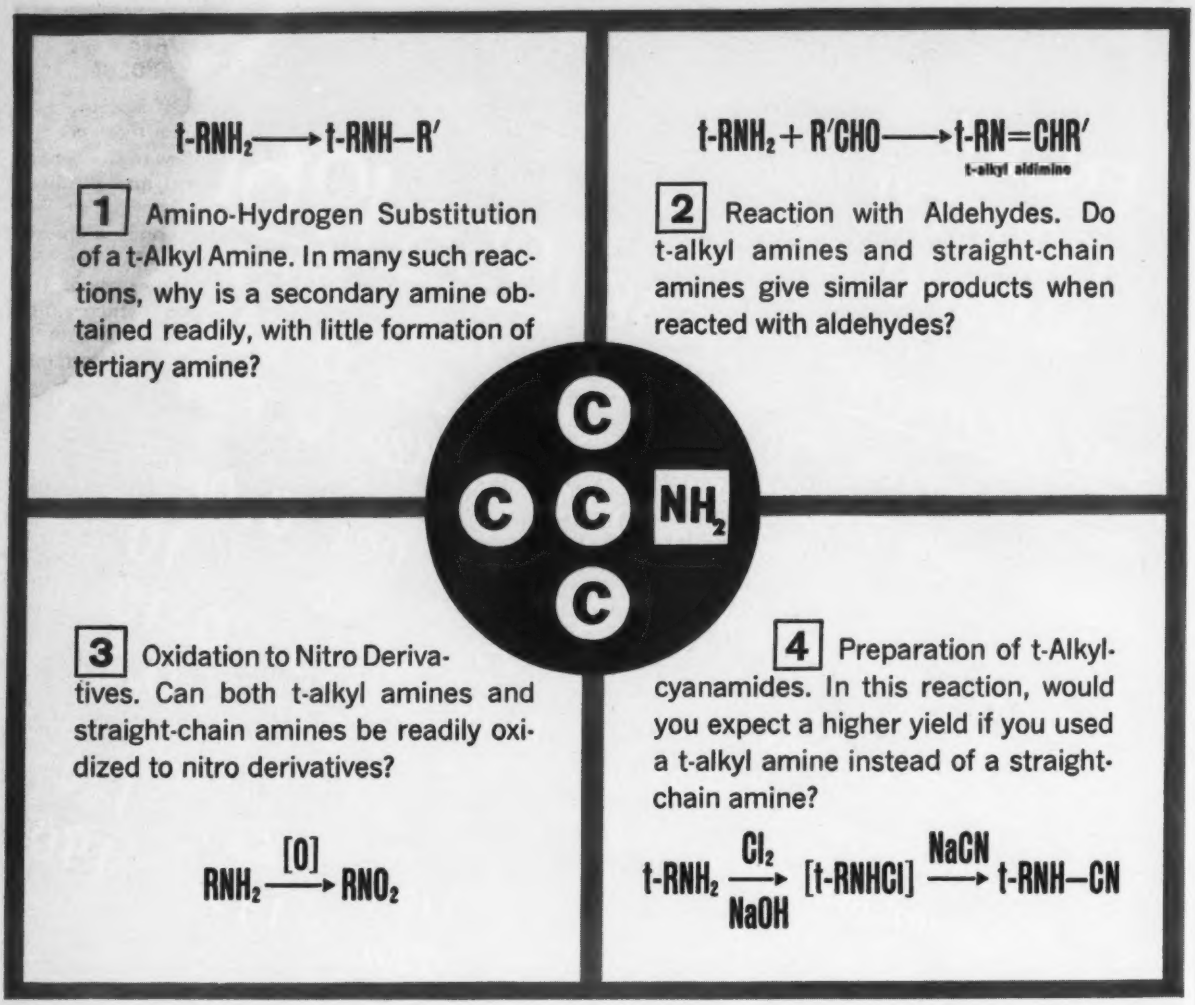
EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY

Check 5701 opposite last page.



t-Alkyl Amine Quiz—with answers worth knowing...

1 Steric-controlled reactivity, provided by the attachment of amino group to a tertiary carbon, permits one amino hydrogen to be substituted easily but retards tertiary amine formation. Similar reactions with straight-chain amines give mixtures of secondary and tertiary amines.

2 No. t-Alkyl amines react with many alkyl and aromatic aldehydes to form stable aldimines, also called Schiff bases. Straight-chain amines and aliphatic aldehydes normally give unstable derivatives.

3 No. t-Alkyl amines are unaffected by a variety of oxidizing agents which break up straight-chain amines to form complex, unpredictable products. When oxidized with a suitable reagent such as potassium permanganate, however, t-alkyl amines undergo clean reactions to tertiary nitroparaffins.

4 Yes. With straight-chain aliphatic amines, this reaction requires close control, since the cyanamides react further in alkaline medium to form isomelamines or substituted guanidines. t-Alkylcyanamides are stable in the presence of a base.

Rohm & Haas t-alkyl amines: PRIMENE® 81-R (12-14 carbons), PRIMENE JM-T (18-22 carbons), t-Butylamine, t-Octylamine, Menthane Diamine.



Write to Dept. SP-12 for samples and a 44-page book giving many reactions of t-alkyl amines.

ROHM & HAAS

PHILADELPHIA 5, PA.

Check 5702 opposite last page.

NEW LITERATURE

Chemical Materials

Trimethoxyboroxine is described in 12-page bulletin that includes data on properties, uses and handling. Storage and shipping information is also detailed. Bul CT-520—Callery Chemical Company.

Check 5703 opposite last page.

Brochure on ethanolamines contains latest available data on these amino alcohols. Major fields of application, physical and chemical properties, toxicity and storage data are included. Ethanolamines bul — Jefferson Chemical Company, Inc.

Check 5704 opposite last page.

Cryogenic temperature conversion data on gold-cobalt versus copper thermocouples are presented in four-page folder. From 0 to 300°K temperature range is covered. Bul TD-65 — Cryogenics, Inc.

Check 5705 opposite last page.

Organic peroxides are comprehensively detailed in brochure of 12 pages. In addition to application and shipping information, there are data on flash points, half life, melting points and safety precautions. "Organic Peroxides" — Lucidol Division, Wallace & Tiernan Incorporated.

Check 5706 opposite last page.

Chemical processing compounds for the metalworking industry are discussed in comprehensive 12-page brochure. Illustrated booklet contains information about 43 products that make up manufacturer's line of cleaning and processing compounds. "Chemical Processing Compounds" — Turco Products, Inc.

Check 5707 opposite last page.

Oxiron epoxy resins are reported on in technical bulletin containing significant data on high-temperature properties and potential of these materials in laminate applications. Six-page bulletin presents information on promising uses in wet lay-up, prepreg and printed circuitry applications. Bul No. 2 — Chemicals & Plastics Division, Epoxy Department, Food Machinery and Chemical Corporation.

Check 5708 opposite last page.

Wetting agents for diversified industrial uses are described in brochure of 12 pages. Accurate Draves wetting times are listed with additional data on chemical and physical properties and general recommendations for use. Brochure ISP-45—Nopco Chemical Company.

Check 5709 opposite last page.

Booklet on formamide is first comprehensive study of chemistry and properties of this chemical. Information is given on compound's utility as a chemical intermediate for nitrogen-containing heterocyclic compounds. Specialty solvent uses are also covered. Formamide bul — E. I. du Pont de Nemours & Company.

Check 5710 opposite last page.

Phenolic resin for industrial and general-purpose elastomer adhesives is subject of bulletin presenting latest technical data on this light-colored heat-reactive compound. Pictures and graphs depict tensile shear, peel back and pre-reacting test data. "Schenectady Presents SP-134"—Schenectady Varnish Company, Inc.

Check 5711 opposite last page.

Solvent folder presents product specifications in comparative form. Typical specifications include distillation ranges and relative time of evaporation. Information is presented on solvent selection. "Amsco Solvents" — American Mineral Spirits Company.

Check 5712 opposite last page.

Physical properties and suggested uses of firm's full product line are presented in 12-page booklet that includes data on polyvinyl formal, butyral, alcohol and acetate resins, emulsions and spray-dried powders. Product reference file—Shawinigan Resins Corporation.

Check 5713 opposite last page.

"White Mineral Oil for Use in the Plastic Industry" is title of nine-page industrial research bulletin. Applications of white mineral oils and fully refined distillates in manufacture of various plastics are reviewed. Typical properties are presented in tabular form. Sonneborn Chemical and Refining Corporation.

Check 5714 opposite last page.

Impregnating solution based on furfuryl alcohol for filling voids in carbon, graphite and other porous materials is detailed in technical bulletin 505 — Chemicals Division, Quaker Oats Co.

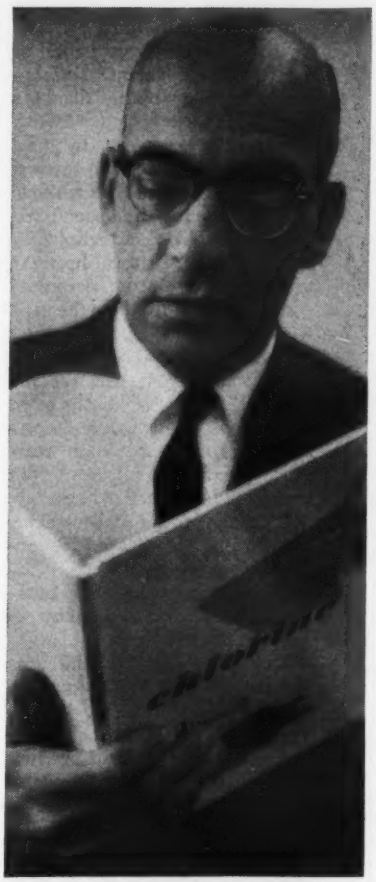
Check 5715 opposite last page.

Uses of acrylonitrile, together with physical and chemical properties, are highlighted in 25-page booklet. Reactions, specification limits, storage handling and toxicological properties are included together with a selected literature reference listing. "Acrylonitrile" — Union Carbide Chemicals Company, Div. of Union Carbide Corporation.

Check 5716 opposite last page.

BRIEFS

Chlorine
Benzoyl chloride
Benzotrifluoride



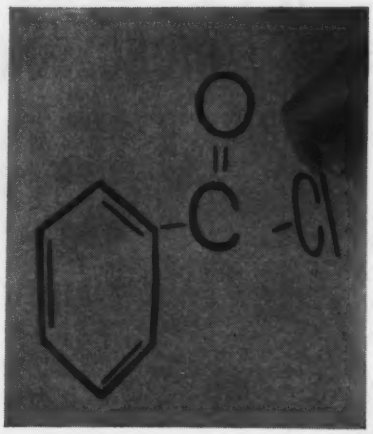
HARD FACTS ON CHLORINE

If you'd like 76 pages of hard, fast facts on chlorine, send the coupon for Hooker Bulletin 125.

It tells a lot about the chemical itself, with charts and graphs on physical properties.

It tells a lot more—about how to handle chlorine safely. Descriptions of equipment and containers should make it easier to run a safe chlorine-handling program.

Finally, there's a listing of the many services you can get from Hooker on chlorine use—services we have developed during more than 58 years of making chlorine.



FAST WAY TO GET A BENZOYL GROUP

Just pull off a chlorine and there you have it.

Our chemical reacts readily. Lets you easily and economically place a benzoyl group in an organic compound—especially through Friedel-Crafts reactions.

It's 99% pure. Clear. Colorless.

It freezes at minus 0.9°C. and boils at 197.3°C. It distills from 2% to 97% over a 3.5°C. range.

You can buy it in carboys, nickel drums, or non-returnable lacquer-lined steel drums, as well as tank trucks or tank cars.

For more information on benzoyl chloride's physical properties and also on uses, send the coupon for a data sheet.

ARE YOU UP TO DATE ON BENZOTRIFLUORIDES?

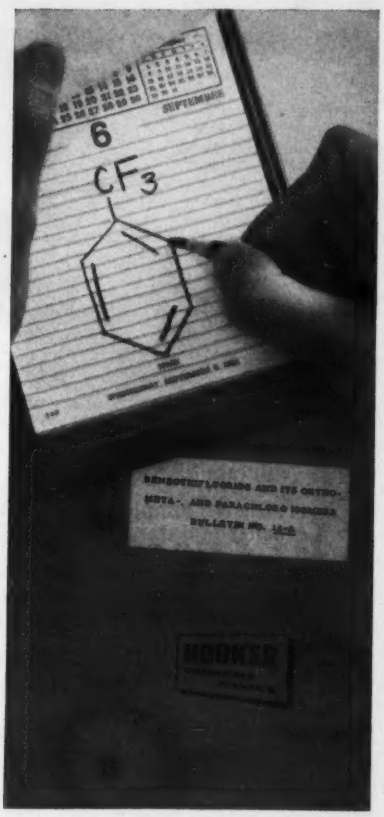
Thumb through the 12 concise pages of our new data file on these chemicals for a quick review of the benzotrifluorides' chemical and physical properties.

Get the latest facts on its *o*-chloro, *m*-chloro, and *p*-chloro isomers.

Learn something new about the score of applications—which range from a lampricide intermediate to pharmaceutical and dye intermediates.

Other useful facts in this free data file are test results for toxicity, and shipping information.

Like a copy? Send us the coupon.



For more information, check here and mail with name, title and company address:

☐ Hooker Bulletin 125 ☐ Benzoyl chloride data sheet

☐ Bulletin 12-A, *Benzotrifluoride and its ortho-, meta-, and para-chloro isomers.*

HOOKER CHEMICAL CORPORATION
509-1 Forty-seventh Street, Niagara Falls, N. Y.

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HOOKER CHEMICALS PLASTICS

Check 5717 opposite last page.

This LITTLE trap does a BIG trapping job— and reduces the cost of discharging condensate



- ... All steel construction for rugged durability.
- ... Design simplified for quick, low cost maintenance.
- ... Compact, lightweight, easily installed. Can be inspected without breaking pipe connections.
- ... Equipped with Nicholson steam-saving Baffle*.

For lowest cost-per-pound of condensate handled, this trap is by far your best buy. Like all Nicholson Thermostatic Traps, it opens ONLY when necessary . . . that is, when sufficient condensate collects in trap body to surround the Monel bellows . . . ONLY then does the pressure inside the bellows reduce below line pressure, the resulting differential causing bellows to contract and instantly activate complete discharge. Body is cast steel and cover forged steel. Cover screws, valve and valve seat are hardened stainless steel. Just *one* working part, so maintenance is practically nil. In ½" and ¾" sizes. For pressures from vacuum to 150 psig. Write for details, including the name of the Nicholson man in your area.

**Patent applied for*

W. H. NICHOLSON and COMPANY

12 Oregon Street • Wilkes-Barre, Pa.

Our 80th Year

Check 5718 opposite last page.

An ausländer at ACHEMA

From page 31

countries and spoke German fluently). But the booths of the more progressive companies were well-staffed with interpreters or other individuals who spoke other languages.

In general, the sell appeared soft rather than hard . . . as we in America have come to identify these terms. Razzle-dazzle, eye-grabbing displays were the exception. Booth representatives were by and large more oriented toward the technical rather than sales. But considering the specialized problems that the technically sophisticated visitors brought to them, this latter arrangement appears to have been a wise one.

Long technical discussions were common in the various booths. The larger booths even contained small private conference rooms for such rapport, participants more often than not being served brandy, soft drinks, coffee and cigarets by smiling frauleins. Nevertheless, exhibitors were without doubt pushing for business; this was their way of getting it.

Crystal clear was the emphasis on continuous processing and on devices, instrumentation and processing schemes that would reduce labor needs. German industry is going through a period of labor shortage so the need for such developments is doubly acute. A stepping up of competition from abroad and in the Common Market complex is forcing moves to more efficient production in Germany and throughout Europe. Process computers, however, gaining a slim foothold now in Europe, were noticeably absent at the exhibition.

Processes Popular

Processes, many being promoted for licensing abroad, were plentiful. Farbwerke Hoechst, for example, displayed a huge scale model of its high-temperature pyrolysis process in its own separate pavilion which also highlighted samples and information about its plastics and other products.

The process, in use for about a year at Hoechst's Frankfurt works, cracks light-naphtha feed to acetylene and ethylene at a temperature of 1200 to 2500°C, depending on ratio of acetylene to ethylene desired. Pyrolysis is followed quickly by a cold-water quench (so larger molecules aren't formed). Then comes a series of purification and separation steps. The final acetylene stream is reported to be over 99.8% pure.

Pintsch Bamag's booth was dominated by the company's continuous, compact steam-deodorization system for animal and vegetable oils. The trays of the system's column are baffled or compartmented in such a way that the oil in effect travels a long "tube," under 1-2 mm vacuum. Hold-up time is about 1½ hr. Systems are built for capacities of 30 to 120 tons/24 hr.

Dr. C. Otto & Company displayed multicolor flowsheets for a large number of processes. Among them: recovery of ammonia by sulfonated divinyl benzene-styrene exchange resins; removal of catalysts from polybutadiene solution in a Podbielniak extractor; a biological trickling filter for removing cyanides from water; catalytic synthesis of HCN from CO and NH_3, with the novel twist of drying byproduct NaCN in a centrifuge with hot gas; production of $CaCn_2$ from CaO, NH_3 and CO in a center-discharge fluidizing furnace.

Visitors with nuclear-technology interests saw a low-temperature system for production of heavy water that delivers D_2O with a purity of 99.8%. A hydrogen-deuterium mixture, previously enriched by electrolysis, is liquefied at −251°C and rectified in a Kuhn column at 22°K where it is enriched 400 times. Product obtained is then burned with oxygen and concentrated in a second Kuhn column.

Fluidized-bed techniques for conveying, mixing, drying, heating, absorption and cata-

lytic reactions are quite evidently growing fast in Europe. The same is true concerning application of film and thin-layer heat exchangers and evaporators for heat-sensitives.

But non-fluidized-bed techniques are also being improved, as for example with continuous moving-bed dryers where drying gases are forced through the bed.

Finding application in the chemical industry—Hoechst is using it now to blend PVC—is the Fuller pneumatic blending silo. The system, already well-established in the cement industry, mixes by introducing air on a controlled programming from a quadranted false bottom. The Hoechst installation blends 150 tph of PVC with about 900 cfm of air.

At the other extreme was a continuous revolving sieve (Alpine Aktiengesellschaft booth) in which an air jet keeps the mesh clear.

Things are happening with filter presses, too. F. H. Schule demonstrated presses with mechanized plate transport which opens the press a plate at a time according to a desired schedule. Only one operator is needed to empty the press; under development is automatic discharge of cake from recessed plate filters, by compressed air, so that no operators are needed.

Plastics Pouncing Hard On Corrosion

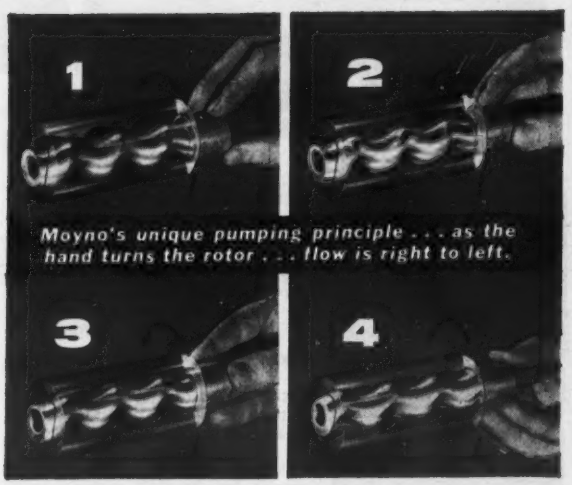
Corrosion protection is certainly just as important to the European chemical industry as it is in America, as indicated by the sizable display space devoted to special materials of construction. There's little doubt that plastics are finding their way rapidly into many pieces of equipment. Germany, according to industry observers, became strongly "plastics-minded" when faced with a lack of steel following World War II.

Polypropylene, polycarbonates and Teflon are being adopted to a surprising extent. Items made from the more



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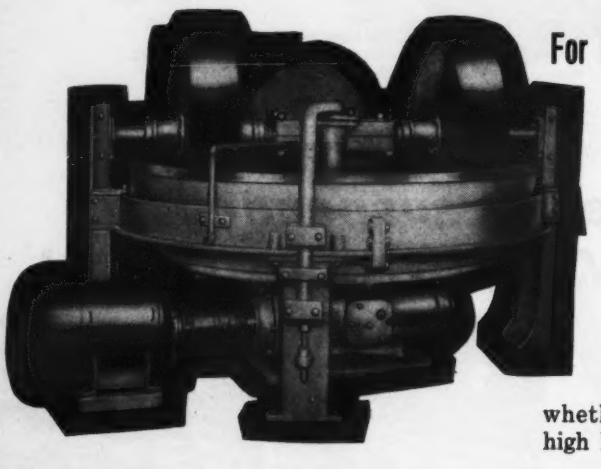
Check 5719 opposite last page.

MIXING • BLENDING • TEMPERING • PULVERIZING • GRINDING:

Whatever your process requirements a Clearfield muller type machine will do it better...and save you money doing it!

For low-cost grinding: Heavy duty Clearfield grinders incorporate all the features essential to efficient, economical grinding. Operating on the revolving pan principle, they have ample-size screen plates in the pan bottom for better control of fineness of grind and rate of discharge. Large, heavy mullers are placed far apart to obtain greatest possible crushing effect; large crushing area per pan revolution gives high output without necessity of excessive pan speed, thereby reducing machine-wearing vibration. Made of rugged, durable materials, Clearfield grinders give you long, low-maintenance service. Available in a variety of sizes, up to 10-ft. diameters. A 10-ft. diameter Maximuller is shown here.





For better-balanced mixing, blending: The wide-faced mullers and revolving pans of Clearfield mixers work together to produce a kneading, smearing, constant-movement action that results in a uniform, even-textured blend...consistently. Whether you need a large-batch mixer or a compact portable mixer, there's a Clearfield machine to handle batches from ½ to 40 cubic feet . . . or for continuous mixing. Shown at left is the 7 ft. diameter Clearfield Model 715.

Here are a few of the features that make Clearfield mixers the most efficient way to mix, blend and temper pre-ground raw materials . . . whether they are dry, semi-dry or with relatively high liquid content:



REVOLVING BOTTOM keeps every particle in the batch in continuous motion. Ingredients are alternately spread and gathered together to maintain highest mixing efficiency. Since the *pan* revolves instead of the mullers and scrapers there is no "lag" in the flow of material.



STAR-SHAPED AGITATOR covers the entire flat surface of the revolving bottom and prevents material from forming hard cakes or lumps. The agitator is driven by contact with the revolving bottom or the material being mixed. This creates an intense "whirlpool" action . . . speeds up the mixing process, promotes clean emptying of the pan.



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Clearfield grinders and mixers can be adapted to continuous or batch process systems. For detailed information, send for free literature.

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An auslander at ACHEMA

From preceding page

common plastics, such as PVC and polyethylene, are very common. Rigid PVC pipe is used extensively in plants. Spokesmen in the Hercules booth, where Penton was the main attraction, said that European visitors were seriously talking over its advantages as a lining material.

Stoneware, porcelain, graphite and glass constructions of improved types were also brought forth. Many large stoneware plants are being armored with glass-reinforced polyester jackets. Much work is being done toward developing special linings for vessels and transport containers made of glass-reinforced polyester, to extend their application.

Graphite structural material impregnated with a special pitch has been introduced by Sigri-Kohlefabrikate for high resistance to strong oxidizing agents. The same company, working with BASF, has developed a new chlorine combustion furnace that claims greater efficiency, increased safety and simpler construction than previous designs.

Titanium liners and components were spotlighted in ICI and Krupp booths. Price breaks have helped to get more of the metal into European plants, just as in the U.S. Krupp displayed a large photo-mural of a German petrochemical plant made largely of titanium. ICI, whose spokesman anticipates that zirconium is the "metal to watch now," brought along some small valves made of this material.

Shell Chemical unveiled a zinc-rich primer using its Epikote resins as binder. Increased chemical resistance, toughness and adhesion are reported. Primed parts can be mechanically handled, cut, welded and bent without appreciable damage to the coating.

While pneumatic process-control devices are used extensively overseas, electronic methods are gaining ground rapidly. Much effort is being extended to further improve reliability and precision, life and standardization. Just as in the U.S., the processing man's eye is looking toward continuous process stream analysis

via spectrometers, etc.

The United Kingdom Atomic Energy Authority demonstrated an automatic chromatograph which was developed for use in a plant processing volatile inorganic fluorides at elevated temperatures and sub-atmospheric pressures.

W. G. Pye showed a high-sensitivity chromatographic process analyzer using an argon ionization detector. It is now monitoring solvent exit streams from synthetic-fiber processes. Pye foresees wide application for it in oxygen plants because of its high sensitivity to trace impurities.

Ball valves are beginning to show up on the other side of the Atlantic. Two exhibitors had PVC-body, Teflon-seat units in their booths. It's too early to tell, they say, how these will go over in Europe, but the interest being generated with this first showing indicates they are on their way to widespread application, just as in America.

Tougher air-pollution regulations in Germany and elsewhere in Europe are generating renewed interest in methods to eliminate this problem. Along this line, Air-Bio-Sana highlighted a model of their biological filter for removing such things as phenol, sulfur dioxide, hydrogen sulfide and solvents from vented or recirculated atmospheres. Bacteria are specially chosen according to the vapors to be removed. With 30 installations under its belt, the company is now planning to look into U.S. markets.

With so much to see in the exhibition itself, visitors were hard put to find time to attend the various lectures and meetings being held at the same time. Among them: a special meeting of the Gesellschaft Deutscher Chemiker, annual meeting of DECHEMA, annual meeting of the Isotopen-Studiengesellschaft; 15th Meeting of the European Federation of Corrosion, and a symposium on structural materials in chemical engineering . . . plus many "short lectures" on a wide variety of subjects of interest to the chemical processing industries. ■

How heavy-duty Nickel Plating protects product purity

Tests show its reliability...

TEST—VARNISH: Test spool immersed 240 hours in cooking kettle for miscellaneous varnish production. Kettle handled nearly every type of varnish. Temp. 525 to 675° F. Aerated and agitated.

RESULT—Average Nickel corrosion rate: 0.0003 ipy

TEST—MOLASSES: Test spool exposed for 44 days in syrup mixing tank containing black strap molasses. Temp. 225° F. Slight aeration, mixing by convection.

RESULT—Average Nickel corrosion rate: 0.0004 ipy

TEST—DE-IONIZED WATER: Test spool exposed 613 days in 10-gallon bucket containing de-ionized water. Water changed every 24 hours. Average temp. 68° F (50 to 88° F), pH 6.0 to 7.0, air free, no agitation.

RESULT—Average Nickel corrosion rate: 0.000002 ipy

TEST—CORN SUGAR: Test spool exposed 115 days fastened to agitator arm of crystallizer in corn (dextrose) manufacture. Temp. 115° F. Well aerated, slowly agitated.

RESULT—Average Nickel corrosion rate: 0.0003 ipy

TEST—GLUCOSE: Test spool exposed for 652 hours in glucose pan in both the vapor and liquid sugar. In this evaporator unit the sugar is concentrated from 28° to 43° Be.

RESULT—Average Nickel corrosion rate: 0.0002 ipy

TEST—CAUSTIC SODA: Test spool immersed for 47 days at point 10 feet from bottom of storage tank containing 76% caustic soda. Temp. 230° F. No aeration. No agitation except that due to top filling of tank.

RESULT—Average Nickel corrosion rate: 0.00008 ipy

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Heavy-duty Nickel plating is now at work in processing:

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Glucose
Ethylene Glycol
Phenol
Ethylene Oxide
Nitrogen Fertilizer
Fatty Acid
Hot Resin
Glycerine

In addition to product purity, you can expect lower maintenance costs and longer life for equipment with a coating of Nickel. On many metals the adhesion of Nickel coatings is excellent...the bond is often stronger than either basis metal or deposit. So where solid corrosion-resisting materials are not needed, a heavy coating of Nickel will often do the job—at considerable savings.

New equipment can be plated in a wide variety of baths before or after fabrication, whichever is more economical. For example, preplated steel is available from electroplaters in several mill forms.

Existing equipment can be upgraded and protected by electroplating with Nickel. The chemical reduction process—electroless plating—can be used to apply a corrosion-resisting layer of nickel-phosphorus alloy even on inside surfaces and over the most complex shapes.

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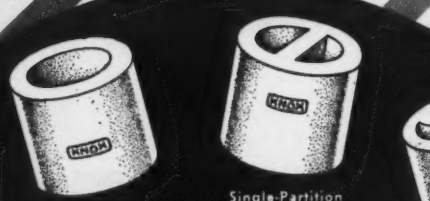
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U V . . . and product future *From page 34*

aging, regardless of sun or artificial source.

This will permit precise laboratory irradiation for test purposes and enable design of UV absorbers with efficiency concentrated in the spectral regions now known to do the most harm.

B. F. Goodrich scientists have done the same[2] with polyurethane (ester type).

Du Pont scientists, using a specially sensitized instrument[3] for measuring minute changes in carbonyl (C=O) content of polyethylene films, have been able to correlate increases in carbonyl content in specimens separately exposed to artificial UV irradiation and to outdoor sunlight.

In an attempt to obtain evidence of chemical alteration of polymer to correlate with UV absorbing effectiveness of benzophenones structurally modified to achieve improved solubilities, Eastman scientists[4] have used an ultra-modern "molecular shaker" — nuclear magnetic resonance techniques.

With this, numerical values of "hydroxy negativity shift" were obtained for each of a wide variety of benzophenone derivatives — which were further found to check with outdoor weathering ratings of the UV absorbers' effectiveness. This new rating system may permit prediction of the effectiveness of proposed new UV absorber molecule modifications, prior to outdoor testing.

Quality Assurances By Brand Name

Plastics materials producers appear to be approaching the problem of quality assurance from the standpoint of endeavoring, as far as practicable, to retain control over use of their materials. This will assure quality of end product commensurate with intended use. In effect, this means that the materials are sold on a proprietary basis, inasmuch as compositions are not disclosed.

An example of this trend is the recent entrance of Owens-Corning Fiberglas into the manufacture of rigid translucent reinforced panels for outdoor exposure applications, made of a resin supplied by Du Pont. Stated reason: "Need for improved industry standards." Cited as of importance is the molding technique used which permits concentration of the heavily stabilized resin at the panel surfaces, reducing possibility of fiber "wicking" of moisture.

Still others are working towards developing and consolidating applications performance information, particularly as it can be related to formulation. For example, the U.S. Defense Dept. has a Plastics Technical Evaluation Center . . . called "Plastec" . . . at Picatinny Arsenal, Dover, N.J., which is patterned after the pioneer Metals Information Center at Battelle Memorial Institute. Anyone with Defense needs can write Plastec for latest applications information on hand, pertinent to the inquirer's problem.

Another Ordnance group at Picatinny runs exposure tests primarily to evaluate changes in strength and other physical characteristics of plastics at sites in Dover, Panama, New Mexico and Alaska. This service exposure information, plus that from other sources, goes into Plastec's respository.

Defense also has other centralized information operations. It is interesting that the Wright Field "Materials Central" has contracted with Syracuse University to produce a glass-reinforced-plastics handbook, compiled from a punch-card repository.

Some groups in the industry favor similar repository activities to stimulate the flow of larger quantities of plastics into outdoor applications. Currently under consideration is formation of a "Plastics Institute," which would serve not only as a centralized repository of design information, but also provide other services not presently available industry-wide.

In the meantime, much progress is being made in understanding and controlling the myriad factors which today face the plastics compounder in achieving UV stability. One of the most important components, for example, that can affect UV stabilization is the plasticizer — which itself may be UV unstable, as may be other additives such as coloring agents. Above all, the components of a plastic composition must not react with one another, or migrate and cause staining when in contact with other polymer systems.

Benzophenones Need Acid or Neutral Media

A limiting quality of the benzophenones is that they must be used with acid or neutral media. In alkaline plastics, the hydroxyl hydrogen of the chelate ring is replaced with a metallic ion such as sodium, and UV absorbency ceases. Because of this and the continuing search for ever-lower-cost UV absorbers which do not impart yellowness to plastics, other absorber types have been developed.

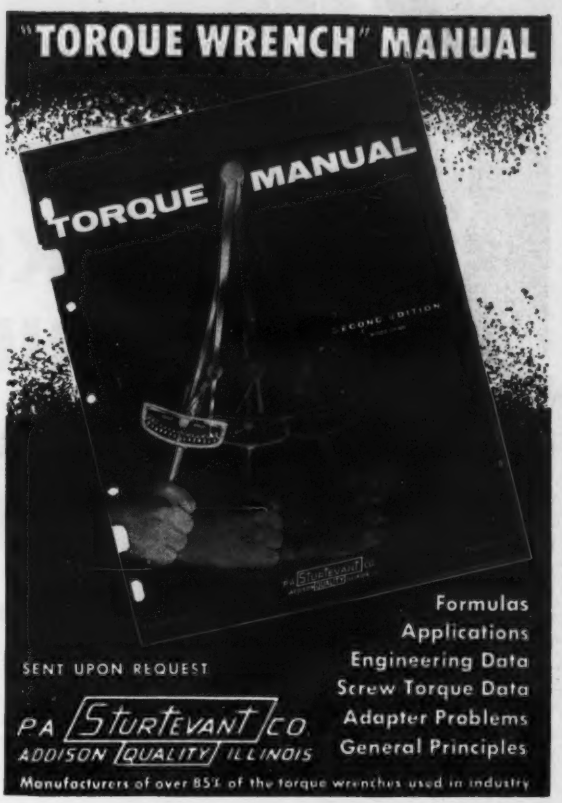
One of these, the benzotriazoles, also has a chelate ring structure, but the hydrogen oscillates to a nitrogen atom instead of another oxygen atom. Still another group is based on substituted acrylonitriles. Both of these are finding usefulness in such alkaline plastics media as urea-formaldehyde, melamine-formaldehyde, epoxy-amine and nylon.

Some polymer systems, particularly the hydrocarbons, may be greatly sensitized to UV degradation by presence of small quantities of metals. Rigid polyethylene, when first introduced, underwent early UV degradation which was traced to metallic polymerization-catalyst residues. Processing changes corrected this.

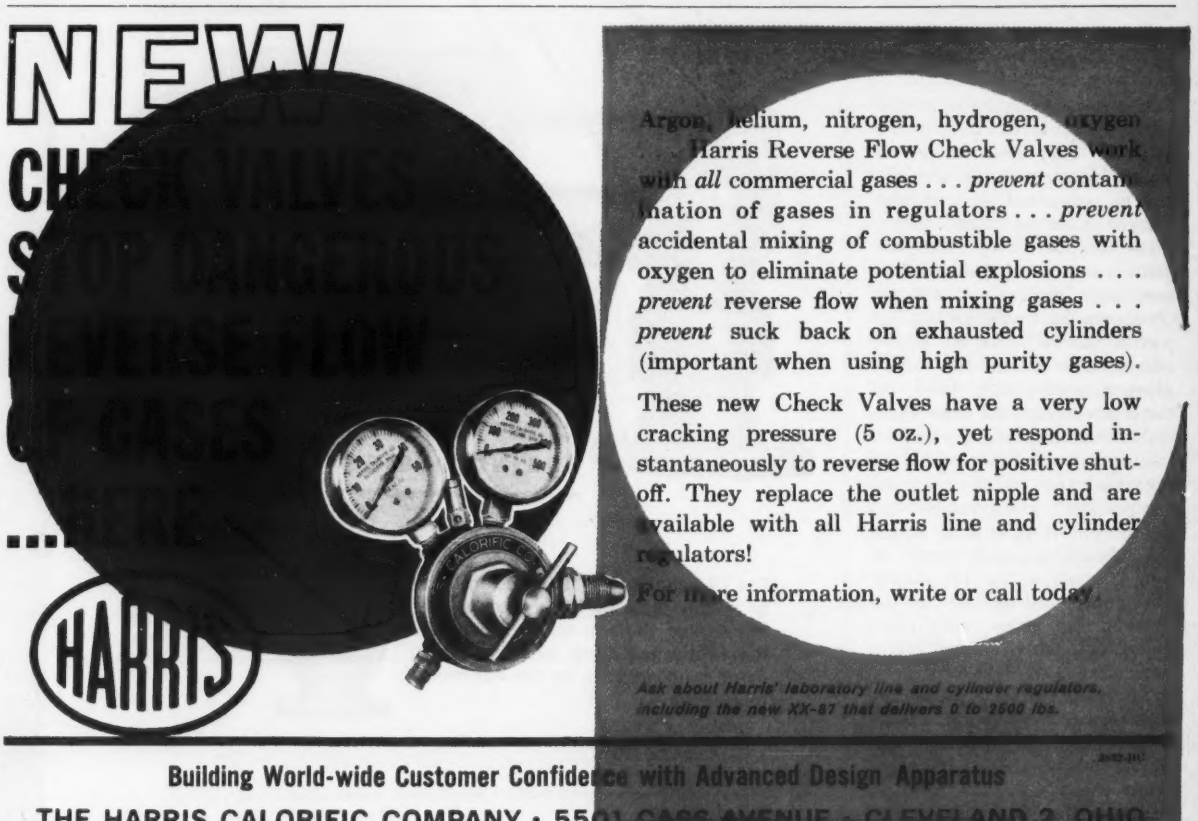
In recently introducing its polypropylene, Eastman emphasized the product's extremely low residual ash (metal) content — consistently less than 0.1% — as an in-



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UV . . . and product future

From preceding page

dication of concern over this factor.

Styrene monomer inhibited with metal compounds to prevent polymerization during storage, and then process-polymerized with excess catalyst to compensate for inhibitor not removed (usually by distillation), has been subject to early UV degradation.

In this connection, indication of further versatility of the benzophenones is reported. A correlation has been found by one producer between high residual metal content in polyoelefin and unusually high concentration of benzophenone derivative required to achieve normal UV stabilization. This group believes the excess UV absorber was consumed by its chelate ring, forming closed-ring compounds with metal ions present — much as sequestering agents (which contain chelate rings) do in commercial practice. So, the benzophenones are thought to have metal-scavenging action.

Question Is: How Long Can UV Absorbers Last?

A practical question in the minds of many working in the field of UV absorbency is: How long can the UV absorbers be expected to function before wearing out? They serve by protecting other organic compounds from radiation they themselves absorb! One area of investigation towards assured longest active service life is in the effect plastics media may have on the longevity of the absorbers.

Another approach with intriguing possibilities is that of incorporating in the plastics composition compounds capable of shifting over to active UV absorbers as a result of long exposure to UV light! One compound already on the market that gives every indication of possessing that characteristic.

Longevity of UV protective agents was very much a consideration when Bell Telephone Laboratories scientists were faced with the problem of selecting stabilizing systems for polyethylene or PVC

NEW CHIKSAN SPRING BALANCED LOADING ARM-

Self compensating spring tension provides complete balance at any position, regardless of position of outer leg. Tension is adjustable if required.

Steel arm is built to take constant use and handling. Top quality components and fabrication mean years of trouble-free service.

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Chiksan Base Arm Sections permit operators to change existing facilities with minimum effort. Base Arm Sections are available in standard sizes of 2", 3" and 4". Riser joint supplied with flanged or threaded connections as desired.



FOLDED ARM MODEL-DS

Standard Sizes: 2", 3", 4". This quality, heavy-duty arm for hard-to-handle chemicals features the versatile DS Series Swivel Joint described below. The swivel joint combination allows for reach to any point within working range from a minimum of 3-feet from riser pipe to a maximum of 11-feet in the two and three-inch arm and 9-feet in the four-inch arm.

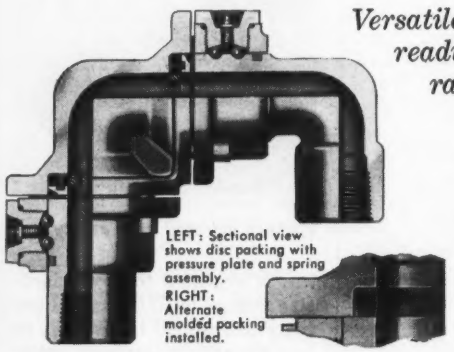
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LEFT: Sectional view shows disc packing with pressure plate and spring assembly.
RIGHT: Alternate molded packing installed.

Versatile DS Series Swivel Joint readily adapted to a wide range of services...

There is a Chiksan packing type and compound for handling nearly every chemical in commercial use, also steam and hot gas as well. Further, the DS Series Joint permits packing replacement without removal of ball bearings.



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61-62

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Check 5727 opposite last page.

which would assure a minimum of 10 years service life for outdoor cable insulation. For this, a light-screening type of additive — namely, channel black as used in rubber compounding — was considered best.

Actually, this form of carbon black is regarded as broadest in protection functions: Pigmentation (screening), UV absorption, and free-radical scavenging (antioxidant). Some grades of titanium dioxide as developed by the paint industry have been found reasonably effective for PVC where white or colors are required.

PVC's Special Need

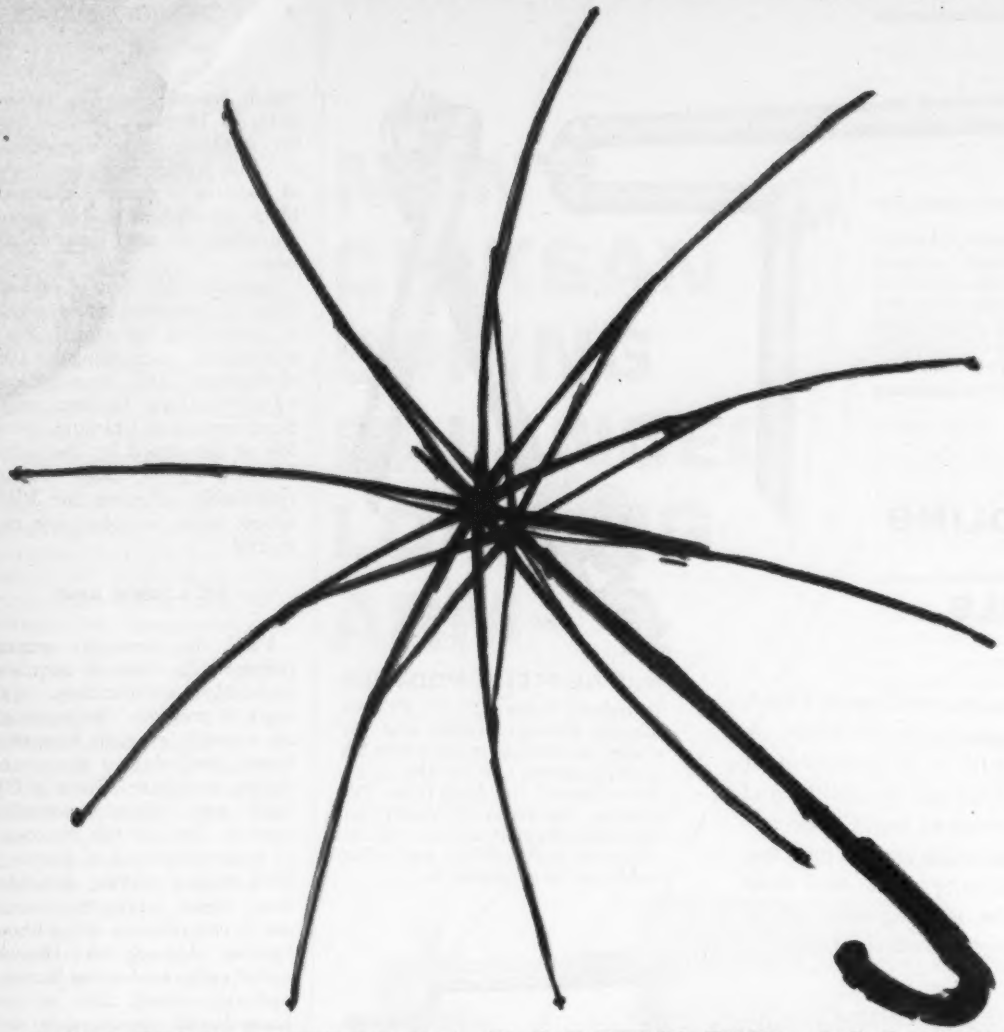
PVC is unusual among polymers in that it requires elaborate stabilization systems to prevent "unzippering" as a result of high temperatures used during the processing, and later effects of UV light and other weathering factors. One of the functions of these systems is to scavenge HCl formed during degradation, which otherwise would act to catalytically bring about further degradation. Heavy-metal salts, containing barium, cadmium, lead, zinc or tin, have found considerable volume of use.

A number of firms now specialize in providing "prescription" stabilizing systems to the thousands of PVC molders and fabricators — whose plants vary from small shops to sizable, highly controlled facilities. Dependence on such suppliers makes their role an important one in maintaining quality control standards for such dispersed industry groups.

Innovation Encouraged To Continue Progress

Under the circumstances indicated above, what can be expected in the direction the industry and other groups may take in continuing progress towards getting more plastics outdoors?

Innovation must be encouraged to continue if ultimate



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Something's missing—if you haven't checked into the full line of Vancoram vanadium chemicals. Some outstanding examples include: catalysts in the chemical and petrochemical industries; corrosion inhibitors; colorants in the manufacture of inks, textile dyes and ceramic glazes and enamels; paint and varnish driers; ultraviolet filters for glasses. Some of the most valuable applications may be those which are not yet commercially established! Listed below are many of the Vancoram chemicals available. Others can be supplied on special order. For further information on vanadium chemicals and how they can be applied to solve your problems, call your VCA representative or write to Vanadium Corporation of America, 420 Lexington Ave., New York 17, N. Y.

Ammonium Metavanadate, Technical NH_4VO_3 • Ammonium Metavanadate, C.P. NH_4VO_3 • Ammonium Vanadyl Tartrate (NH_4) $VOC_4H_3O_6$ • Magnesium Metavanadate, C.P. MgO V_2O_5 x H_2O • Sodium Metavanadate, C.P. $NaVO_3$ x H_2O • Sodium Metavanadate, Technical $NaVO_3$ x H_2O • Sodium Orthovanadate Na_3VO_4 x H_2O • Sodium Pyrovanadate, Technical $Na_4V_2O_7$ • Vanadium Chloride Syrupy, C.P. $VOCl_2$ x H_2O • Vanadium Oxytrichloride, C.P. $VOCl_3$ • Vanadium Pentoxide, Technical V_2O_5 • Vanadium Pentoxide, Purified V_2O_5 • Vanadium Pentoxide, C.P. V_2O_5 • Vanadium Sulphate, C.P. (Vanadyl Sulfate) $VOSO_4$ x H_2O • Vanadium Tetrachloride, C.P. (Hypovanadic Chloride) VCl_4 • Vanadium Tetroxide, C.P. (Vanadium Dioxide) V_2O_4 • Vanadium Trichloride, C.P. (Vanadous Chloride) VCl_3 • Vanadium Trioxide, C.P. (Vanadium Sesquioxide) V_2O_3 • Vanadyl Oxalate VOC_2O_4 • Vanadium Acetyl Acetonate VOC_5H_6 O_2 • Calcium Pyrovanadate $Ca_2V_2O_7$ • Lead Vanadate $Pb_2V_2O_7$

VANCORAM CHEMICALS

Check 5728 opposite last page.

UV . . . and product future

From preceding page

10-20 year outdoor service life is to be assured for plastics. Resin structure developments may bring forth new materials of inherently greater stability to UV. Meanwhile, absorber developments will continue towards goals already indicated. Then, too, studies of plastics composition components may produce combinations of synergistic effect, reduce interactions and thus the need for UV protection. ■

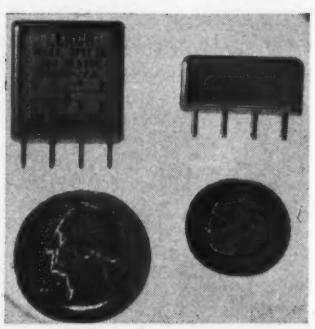
Literature Cited:

(1)—Hirt, Searle, Schmitt (Cyanamid), *SPE Trans.* **1**, 1, Jan. 1961. Also, Hirt, Schmitt, Searle, Sullivan, *J. Opt. Soc. Amer.* **50**, 3, July 1960.

(2)—Schollenberger & Dinsberg (Goodrich), *SPE Trans.*, **1**, 1, Jan. 1961.

(3)—Westereat (Du Pont), *Anal. Chem.* **33**, 6; May 1961.

(4)—Chaudet, Newland, Patton, Tamblyn (Eastman), *SPE Trans.*, **1**, 2, April 1961. Also, Chaudet & Tamblyn, *SPE Trans.*, **1**, 1, Jan. 1961.



Tiniest crystal can relay

. . . is expected to have giant-size impact on U.S. crystal can market. Dubbed the M-250, its configuration insures better than 50% space economy in a printed circuit.

Shown above (right) in comparison with the previous smallest subminiature relay, the M-250 is only 0.35 oz in weight and 0.128 cubic inches in volume. It is so small that it can be used standing up without increasing the thickness of an electronic package's "sandwiches." M-250 is a development of the Leach Corp., Los Angeles, Calif.

Using an economical and efficient combination of corrosion-resistant, resin-based compounds and glass cloth, Champlin Oil & Refining . . .

Saves $7000 in column repairs plus five weeks' downtime

TED F. MEINHOLD, Associate Editor
with **T. J. WHEELER,** District Process Engineer
Champlin Oil & Refining Company
Bishop, Texas



After: *Repairs on 30-foot high unit (center) were completed in six days at a cost of $780. Replacement price would have been about $8000*

Problem: The gas condensate stabilizer column for crude hydrocarbons at Champlin Oil & Refining Company's La Reforma dehydration plant, McAllen, Texas, had corroded to such an extent that there were holes eaten through its walls.

A NEW SOLUTIONS FEATURE

Made of carbon steel, the column operated at 40 psi, was 30 feet high and had a four-foot diameter at the bottom. Replacement cost was estimated at $8000.

Corrosive attack took place from outside the vessel through moisture condensing on the cold column. Salt air existing in the surrounding area also contributed to the problem — even though the column's exterior surfaces were covered by a two-inch layer of glass wool insulation.

Solution: Close examination in the Spring of 1961 indicated that any attempt to repair the column by metal welding or other conventional techniques would be extremely difficult, time-consuming (an estimated five or six weeks) and expensive — perhaps costing as much as a new unit. Consequently, the company decided upon a repair method involving use of corrosion-resistant, bisphenol-A polyester resin-based compounds and glass cloth.

The specially-formulated materials are easy to apply and can be cured on the job by the addition of measured amounts of liquid accelerator (6% cobalt naphthenate) and catalyst (methyl ethyl ketone peroxide).

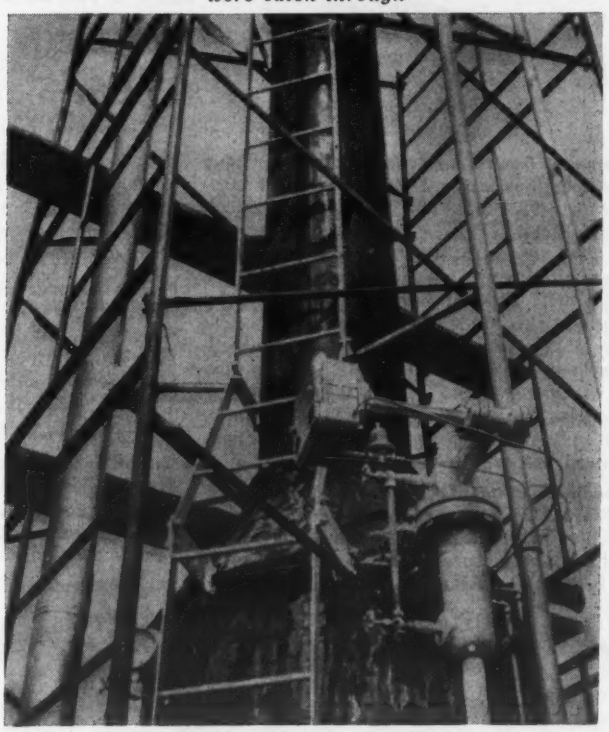
In the repair process, the first step was to remove all insulation from the vessel and sandblast the exposed metal surfaces. A prime coat of low-viscosity resin was then immediately brushed on to prevent rusting.

Following this, all joints, ribs, welds, supports, angles and crevices were filled and shaped to smooth radii and fillets by use of a heavy-viscosity, resin-based, fiber-putty compound.

After about an hour of set-

To next page

Before: *Corrosion of Champlin Oil & Refining's stripping column for crude hydrocarbons was so extensive that walls were eaten through*



ting, sharp edges or rough surfaces were filed or sanded smooth. It is important that the surface to which the glass reinforcing cloth is applied be absolutely smooth, because cloth must be put on in even, well-wetted layers without any entrapped air pockets.

The first of three layers of glass cloth was laid on top of a brushed coat of heavy-viscosity, paste resin having thixotropic properties. One gallon of the resin was used for approximately every 45 square feet of surface.

Cloth was then wrapped around the vessel and pulled tight into the wet resin. The glass material consisted of 12-mil fibers and was 38 inches wide, weighing seven and one-half ounces per yard. A medium weave was specified. Too loose a weave would not be strong enough; too tight a weave would make it difficult for the resin to penetrate. Cloth was furnished Volan finished with vinyl silane compound for wetting and "coupling."

During the application, the resin was worked up through the cloth by brush to insure complete wetting of fibers and no entrapment of air. Glass-fiber tape was used around ports, nozzles and connections to "flash out" the job.

Laps of at least two inches were used between adjacent sections of glass cloth. The second and third layers were applied in the same manner as the first. A protective topping of medium-viscosity, thixotropic resin finished up the job.

Results: When tested under twice the normal operating pressure (at 80 psi), the column showed no signs of leaks. The unit was placed back on stream more than a year and a half ago. As of this writing, it is giving excellent service and is expected to continue to do so for many years.

Total cost of the repair job was $780 — considerably less than the $8000 it would have taken to replace the vessel. Downtime was only six days, compared to five or six weeks that conventional repair techniques would have consumed.



In a laboratory test, samples of Garlock 5881 packing were immersed in a 25% nitric-75% sulfuric acid mixture at room temperature. After 8 minutes agitation the samples caused the acid solution temperature to increase but 1.5°F . . . indicating only slight reaction. Increases up to 5°F are considered acceptable for nitric acid service.



ENGINEERED TEFLON PACKINGS for Chemical Processing

Now . . . another Garlock exclusive! A low-cost blue asbestos packing that resists STRONG acids at temperatures from −90°F to +500°F. It's new Garlock 5881 LATTICE BRAID† . . . laboratory tested and proved to be non-nitrating. A completely new Garlock manufacturing technique combines the blue asbestos with over 30% sintered Teflon* (by actual weight); this adds greater stability under temperature changes and outstanding resistance to glazing. Garlock 5881 LATTICE BRAID** is non-absorbent, with no "wicking"; hence it has minimum swell. Countless bearing points of Teflon powder reduce friction and wear. Retightening or adjustments are rarely, if ever necessary.

Yours at the price of regular packing. Garlock 5881 LATTICE BRAID Packing sells for almost 40% less than other blue asbestos Teflon Packings. Yet, you enjoy all the above features *plus* the advantages of exclusive LATTICE BRAID construction—completely integrated structure for greater strength, longer life, more flexibility and lower maintenance cost. No single outer braid or cover to wear through. Holds together without disintegrating, wears far beyond ordinary packings.

Fast warehouse delivery. Garlock 5881 LATTICE BRAID Packing is immediately available in sizes from ¼" through 1" in either spool or reel form. Call your Garlock representative at the nearest of 26 Garlock sales offices and warehouses throughout the U.S. and Canada. Or, write for Catalog AD-185, Garlock Inc., Palmyra, N.Y.

Canadian Div.: Garlock of Canada Ltd. **Plastics Div.:** United States Gasket Company. **Order from the complete line** of quality Garlock products . . . Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Stock and Parts.

†Registered Trademark *DuPont Trademark **Patent Applied For

GARLOCK

Check 5729 opposite last page.

It is estimated that the materials used for repair cost $400. Labor, involving use of three men for three days, ran $180. Contract sand blasting to prepare the surface was $200. A total of 23½ gallons of resin compounds and 125 yards of glass cloth was used. Also involved were 10 gallons of acetone (for cleanup) and small quantities of liquid catalyst and accelerator for curing the resins.

(Brutem-formulated resin compounds used for repairing the column are product of Industrial Waterproofing Division of Tex-Tube, Inc., 1139 Seamist Drive, Houston 8, Texas.)

Check 5730 opposite last page.

(Further information about Atlac-382 bisphenol-A polyester resins may be obtained from Atlas Chemical Industries, Inc., Wilmington 99, Delaware.)

Check 5731 opposite last page.

PVC plastic sheet withstands 215°F

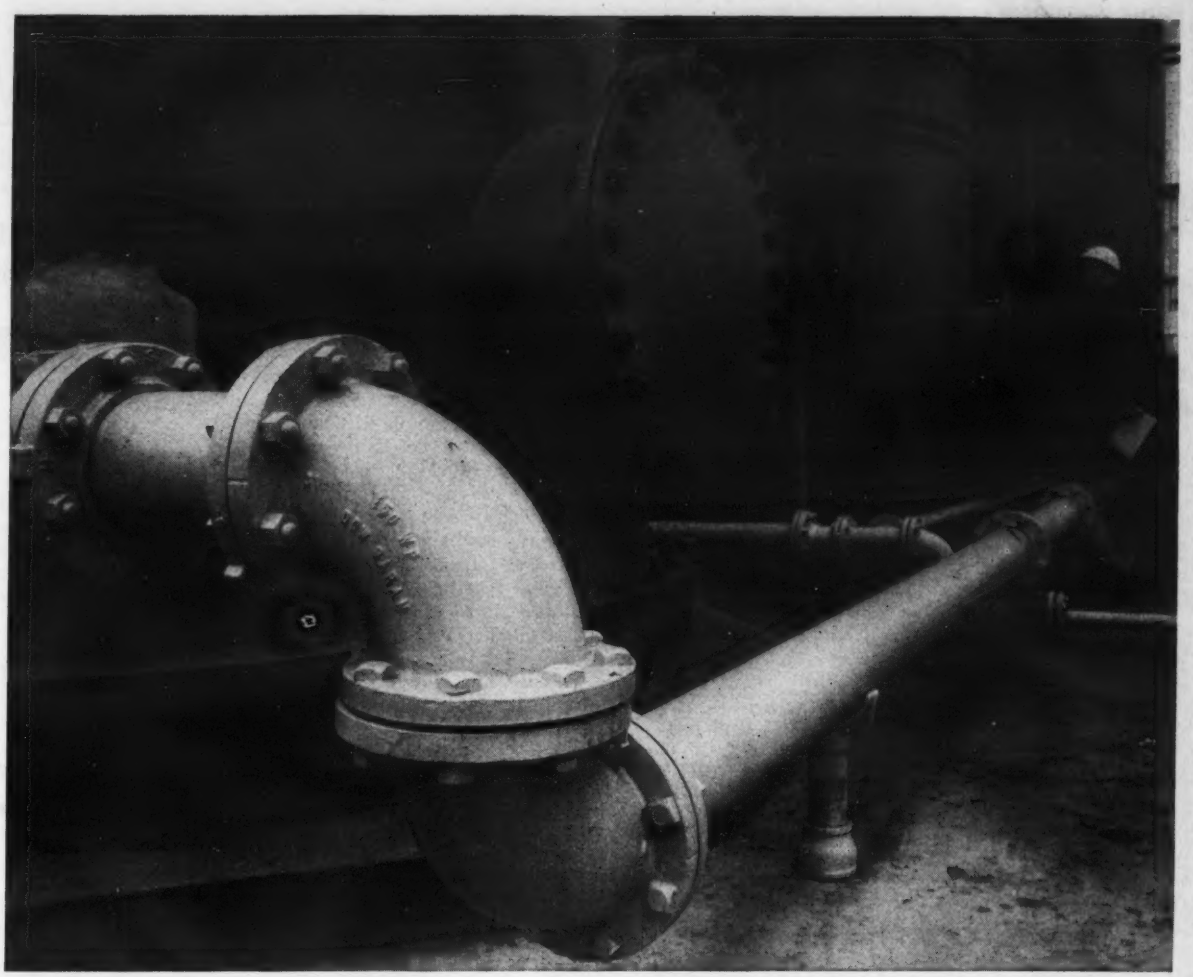
Opens door to wider use in chemical field

Lightweight, PVC plastic sheet capable of withstanding boiling water has been developed for industrial use. Called hi-temp PVC, material is available in both normal and high-impact grades. It can be cut with an ordinary saw and joined by welding or cementing.

Sheets come in four-by-eight foot sizes. Thicknesses range from one sixteenth to one inch. Manufacturer states that the material will make it possible to produce wider range of PVC ductwork and tanks handling strong acids and other hot corrosive liquids. Maximum temperature that sheet can withstand is 215°F — about 60° higher than conventional material.

(Hi-temp PVC was developed by Seiberling Rubber Company, Plastics Division, Akron 9, Ohio.)

Check 5732 opposite last page.



Wyandotte Chemicals Corporation, Wyandotte, Michigan

SARAN LINED PIPE—"Superior under highly corrosive conditions... our own crews install it."

For the past seven years, Saran Lined Pipe has carried highly corrosive acids and processing chemicals for Wyandotte Chemicals Corporation, Wyandotte, Michigan. In one area, Saran Lined Pipe has carried monochloroacetic acid continuously since 1955 *without a single lining failure!*

"Saran Lined Pipe has given us superior performance under highly corrosive conditions," says Mr. Charles H. Culnane, Plant Superintendent. "It's the most practical transporting medium available for use under severe conditions and temperatures which reach as high as 180° F.

"Saran Lined Pipe has high structural strength, which means maximum safety for personnel working in the area. Other, more fragile pipe could break if accidentally hit, but not Saran Lined Pipe. And because it needs a minimum of support, labor and material costs to install it are less than with other kinds of pipe."

"All Saran Lined Pipe is installed by our own crews, using regular pipe fitters' tools and techniques," explains Mr. William Tucker, Maintenance Manager. "It can be easily installed by any experienced pipe man. As we need them, we cut short sections to length from our ten-foot stock sections of different size pipe. Thus we can install Saran Lined Pipe when required, not at a supplier's convenience!"

For chemical piping systems that will provide years of trouble-free service—consider Saran Lined Pipe. Saran Lined Pipe, fittings, valves, and pumps are available for systems operating from vacuum to 300 psi, from below zero to 200° F. They can be cut, fitted and modified easily in the field without special equipment. For more information, write Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale, Michigan, Dept. 1572LG9.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

Check 5733 opposite last page.



EXTRA STRONG . . .
BETTER LOOKING . . .
LIGHTER WEIGHT!

Exclusive swaging and forming process prevents cross bars from turning, twisting, coming loose or falling out . . . provides greater strength and rigidity than gratings using obsolete methods of joining bars. Only Gary Galok Aluminum Gratings offer all these advantages:

High strength to weight ratio. Minimum deflection . . . easier to install.

Non-rusting and corrosion resistant. Ideal where chemical conditions prevail.

Can be used for decorative purposes, sun-shades, grilles, etc. Can be anodized in sunfast colors to blend with surroundings.



Available with serrated or plain bars—in all sizes to meet practically every requirement.

*Patent Pending

Write for Bulletin A759
Dept. I-16, E. Seventh Ave., Gary, Indiana

ROCKWELL-STANDARD CORPORATION
Grating Division, Gary, Indiana

Check 5734 opposite last page.

CORROSION CONTROL

Jet technique speeds clean-out of graphite heat exchangers

High-pressure, jet cleaning technique that by-passes need for tedious and time-consuming mechanical methods promise to extend use of impervious graphite, tube-type heat exchangers to applications involving even the most extreme fouling conditions.

A good example of what the method can do is illustrated by the following case involving tube-side cleaning of a Karbate impervious graphite heat exchanger having 36 tubes, each 12-ft long with ⅞-in ID. Deposits of medium-hard petroleum coke had restricted 75% of the tubes completely, greatly reducing heat transfer and process flow.

Attempts to rod out the tubes with solid steel rods failed. Revolving cutter heads were tried but they resulted in damage to tube walls. *High-pressure jet cleaning at 2500 psi and 30 gpm did a perfect job in only one hour.*

Use Mobile Unit

All necessary equipment for the cleaning operation can be mounted on a mobile unit. Heart of the paraphernalia is a positive-displacement pump capable of producing 6000 psi. Device discharges either water or specially-selected cleaning solvents through a flexible hose to hollow steel lances equipped with nozzles.

Nozzle-end of lance is inserted into heat exchanger tube. Pump is then brought up to pressure and lance gently forced through entire length of the tube. In cases of light fouling, deposits are flushed ahead of the nozzle. With plugged tubes, reverse flow carries deposits back.

The flexible hose permits cleaning of exchangers up to 400 ft from pump. The cleaning technique is also applicable to metal as well as graphite heat exchangers.

(Information about high-pressure, cleaning technique may be obtained from Sumco Engineering Inc., Caldwell, N. J.)

Check 5735 opposite last page.

TRIMflex®

CORROSION RESISTANT
TEFLON* CORE
FLEXIBLE, BRAIDED
METAL HOSE



TRIMFLEX provides protection from chemicals, solvents and other corrosive fluids which attack ordinary hose. Stainless steel or bronze overbraiding provide maximum resistance to flexing, pressure and vibration. The Teflon core is chemically inert and stable . . . withstands temperatures from —65°F to 500°F. TRIMFLEX fittings are available either permanently swaged to the hose or detachable and reuseable.

Write for Bulletin No. 5

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A-2 @Timely TM. *Du Pont TM.

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For numerous multiple-nozzle applications, because the square spray patterns "fit together", here are nozzles that make possible uniform, complete coverage with fewer nozzles per manifold. This is the latest design in Spraying Systems' very complete line of FullJet nozzles in square and standard-circular spray patterns. For complete information write for Bulletin 105 and Catalog 24.

SPRAYING SYSTEMS CO.
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AMERICA'S MOST COMPLETE LINE OF SPRAY NOZZLES

Check 5737 opposite last page.

For more information on product at left, specify 5738 . . . see information request blank opposite last page.

▶ A NEW SOLUTIONS ARTICLE

H_2SO_4 mixing header made of PVC pipe trims repair costs

Problem: Sulfuric acid-water mixing header lasted only about a month at Falcon Chemical Corporation, Lake Charles, La. Corrosive attack by the acid caused serious maintenance problem.

Unit was used to dilute 98% acid with water to produce 5% solution. Installation consisted of 2"-diam metal pipe for water service, 6" pipe for the mixing header and 1½" pipe for 5% acid discharge. Operating conditions are 60 psi and 100°F.

Solution: Components made of polyvinyl chloride were installed. Connections were made with PVC flanges to existing ferrous flanges. Acetone was used to clean fitting sockets and pipe ends prior to solvent cementing. Only tools needed were hack saw to cut pipe and a file to smooth saw tooth marks. Schedule-80 PVC pipe was used.

Results: The PVC acid-mixing header was placed in service in October 1959. Recent inspection indicates that the plastic pipe is still in excellent condition. At no time, since original hydrostatic testing, have leaks been experienced.

Because of its low thermal conductivity, the PVC has resulted in faster heating during startup.

(Further information about PVC pipe may be obtained from A. M. Byers Company, Clark Bldg., Pittsburgh, Pa.)

Check 5739 opposite last page.

Uses of sprayable coating of Penton in water solution are told in four-page bulletin. Material withstands corrosive attack from most acids, alkalis, salts and solvents up to 210°F. Bul 1007, "Pfaudlon 301" — Pfaudler Company, division of Pfaudler Permutit Inc.

Check 5740 opposite last page.



Photograph courtesy of The Atlantic Refining Company

How to stand off graphitic corrosion

Pump components still good after four years handling acid water

In both mild and severe corrosive media the damaging effects of graphitic corrosion can be disastrous to pumps, valves, and other components.

That was what happened to this centrifugal pump's cast iron parts over three years ago—a pump handling each day thousands of gallons of water with a pH of 5.5-6.5 (H_2SO_4).

Type 1B Ni-Resist, containing 15% nickel, was selected for a new two-part pump casing and pump impeller. Because of Ni-Resist cast iron's inherent resistance to such corrosives, it's been on this pumping job for three years.

The result? There was no replacement of these parts. No evidence of graphitic corrosion. And no pump downtime.

This centrifugal pump is another example of how the easily cast and readily machined Ni-Resist irons fight off the attack of corrosion, erosion, wear, heat, and other severe service conditions.

The Ni-Resist family of irons may prove most practical for your pumps, valves, and piping, too. To have all the facts, send for the free 70-page booklet, *Engineering Properties and Applications of Ni-Resist Irons.*

WHAT ENGINEERS SHOULD KNOW ABOUT GRAPHITIC CORROSION

Exposed to certain corrosive environments, cast iron suffers graphitization: it loses much of its ferrite; a coating rich in graphitic carbon remains.

Graphitized Coatings may accelerate the corrosion of the cast iron base or of another iron part in contact with it. The corrosion mechanism is galvanic action.

Experience has shown very little such effect on Ni-Resist cast irons.

THE INTERNATIONAL NICKEL COMPANY, INC.
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Check 5742 opposite last page.



The 'new look' in pipeline insulation

Tough, stainless-steel jacketed material resists corrosion, fire and mechanical abuse; assures less maintenance at Union Carbide

DURABILITY, safety and good appearance . . . these are some of the benefits reported by Union Carbide Chemicals Company through the use of stainless-steel jacketed insulation at its West Virginia plants. Covering 20,000 sq ft of electrically-heated pipe carrying various liquids and gases, the prefabricated material is expected to provide many years of protection against weather and corrosive environments.



Stainless-steel shield around calcium silicate insulation is 0.010" thick

Although the installed price of insulation with the stainless-steel weather barrier may be as much as 33% higher than other metal-jacketed insulation, the former has certain qualities that, in the long run, may make it more economical. Take maintenance, for example. In a chemical plant, insulated pipe is often subjected to tough mechanical abuse. The high strength of stainless steel permits it to withstand hard external blows. The installed jacketing even resists being punctured when walked upon. It can also be repeatedly removed and put back on again without being damaged.

Studies have shown that 0.010"-thick, stainless-steel sheet has sufficient strength to provide the properties needed. Impacts up to 20 ft-lb caused only slight dents, while a competitive metal sheared at 11 ft-lb.



After installation of stainless-steel jacketing, joints are easily connected with closure bands



Insulated pipelines at Union Carbide Chemical Company plant are protected against corrosion and mechanical abuse by tough, stainless-steel jacketing

Excellent chemical and fire resistance are other advantages of the stainless-steel jacketing. It is immune to both acid and caustic atmospheres. Subjected to gasoline flames in fire-resistance tests, the stainless steel was undamaged after 1½ hours' exposure.

Stainless steel jacketing stays cooler than other metal jacketing because of its higher surface emissivity. Therefore, there is less likelihood of serious burns when an operator touches it.

Developed as Joint Venture

The insulation used in the West Virginia plants was developed on a cooperative basis by Union Carbide Metals Company and Union Carbide Chemicals Company, both divisions of Union Carbide Corporation. It was produced by Johns-Manville Corporation. The insulating material consists of calcium silicate. The stainless-steel jacket is factory-applied, resulting in a convenient, ready-to-use unit. The product is manufactured in 36″ lengths, which can be cut with a conventional hand saw.

Insulation and jacketing are installed as follows: The insulation is simply opened, placed around the line (and tracer, if present), then reclosed. One or two stainless-steel, weather-barrier jackets (depending upon pipe diameter) secure the insulation. Joints are connected and made water-tight by metal snap-strap bands, with a non-setting sealer.

If it ever becomes necessary to remove the insulation because of changes or for inspection, it can be quickly and easily done with little or no loss of material.

The art of producing stain-

To next page

For handling hazardous chemicals it's **NORTH PVC SAFETY CLOTHING**

Greater protection ... more comfort and flexibility



Jomac offers three types of special polyvinyl-treated material in protective clothing for use in handling hazardous chemicals:

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Jomac also makes a complete line of North PVC coated gloves to serve the chemical industry. Send for detailed information on clothing and gloves.

Available in these three fabrics are coveralls, jackets, pants, hoods, sleeves and aprons. We can adapt these materials for use under special conditions. Call on our technical people to work out any problem you may have that protective clothing can solve. We will send sample swatches for testing upon request.

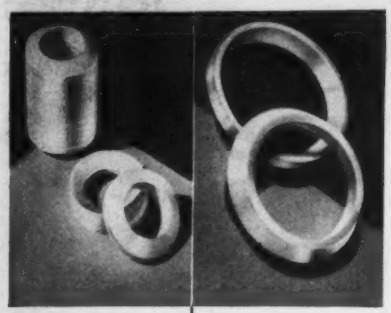
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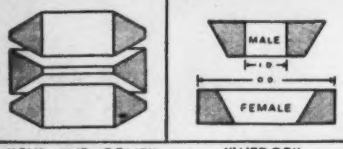
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Check 5743 opposite last page.

NEW CHEMPRO LOW GLAND PRESSURE TFE TEFLON† PACKING SETS





"CUP AND CONE" "WEDGE"

USED FOR VALVES, HEAT EXCHANGERS AND OTHER STATIC AND SEMI-STATIC APPLICATIONS

Chempro Style 300 "Cup & Cone" and Style 305 "Wedge" packing ring sets are two new resilient, low gland pressure packings designed for tight, sure sealing with a minimum gland pressure. Nominal gland pressure causes the rings to slide against each other, exerting pressure both against the stem or rod and the bore.

These packings have all the advantages of Teflon, being completely unaffected by the strongest acids, solvents and alkalies.

COMBINATION SETS AVAILABLE FOR ROTATING SERVICE

Resilient Chempro "Cup & Cone" or "Wedge" rings can be combined with tough, pressure-resisting Chempro Style 101 packing rings to form a rugged combination set ideal for use on a wide range of rotating or reciprocating services.

Write for revised Chempro Bulletin CP-552, giving complete ordering information.

† duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.

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Check 5744 opposite last page.

CORROSION CONTROL

less-steel jackets for valves, elbows and other fittings has not as yet been developed sufficiently to be economical. Studies are currently being made for means and methods of producing these complicated shapes.

At Carbide, such fittings were covered with prefabricated insulation fitting covers and were coated with fire-resistant PVA mastic. The latter was then painted to match the color of the stainless jacketing. Pigmented mastic could also have been used.

(More information about Metal-On insulation may be obtained from Johns-Manville, 72 East 40th Street, New York 16, New York.)

Check 5745 opposite last page.

▶ A NEW SOLUTIONS ARTICLE

Penton-lined plug valves end valve headaches in wood plant

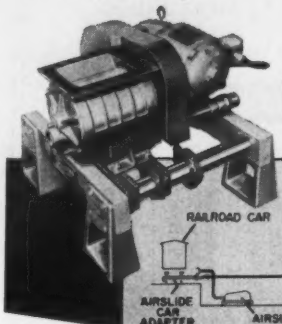
Problem: Corrosive attack caused iron-bodied gate valves to fail and be replaced after eight months of service at the wood impregnation plant of Protexol Corporation, Kenilworth, New Jersey. Valves handled solutions made up of



Plastic-coated, lubricated plug valve has only one moving part, can be opened or closed by only ¼ turn of handle

ammonium salts and members of the boron group. Stainless steel and other alloy valves were tried, but provided no improvement.

Solution: Penton-coated, lubricated plug valves were installed. Product is a chlorinated polyether made by Hercules Powder Company. It has good temperature toler-



THINKING ABOUT

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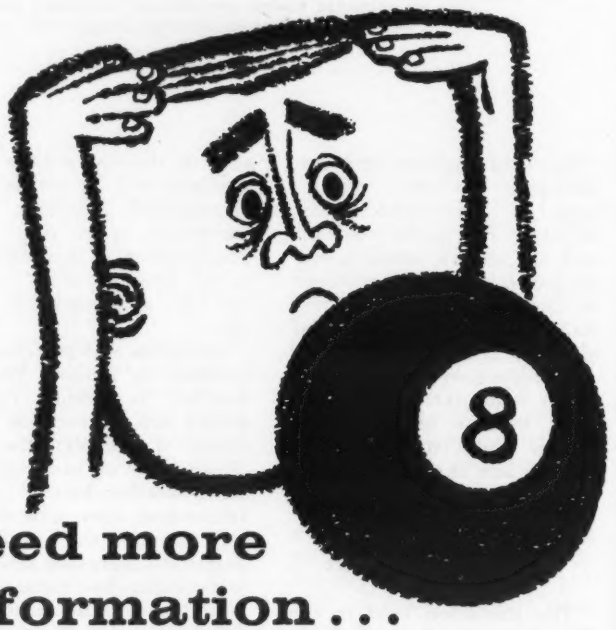
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ance (up to 250°F), surface adhesion, abrasion resistance, resilient structure and resistance to cyclic wear.

During two years of tests, such plastic-lined valves, which cost 80% less than similar type stainless steel valves, outlasted the latter, even under most severe corrosive conditions.

Results: The Penton-coated, lubricated plug valves have given a combined total service of six years (four years for a 1½" and two years for a 4" valve) and show no signs of wear. Cost of the valves was about the same as that of the iron-bodied gate valves previously used.

(Plastic-coated plug valves are product of Nordstrom Valve Div., Rockwell Manufacturing Co., 398 N. Lexington Ave., Pittsburgh 8, Pa.)

Check 5747 opposite last page.

Airless-spray technique reaps more advantages for vinyl coatings

Vinyl coatings designed for use with airless spray equipment have been introduced. The airless technique permits continuous passes to be made to build up virtually any desired mil thickness in one coat, without sags.

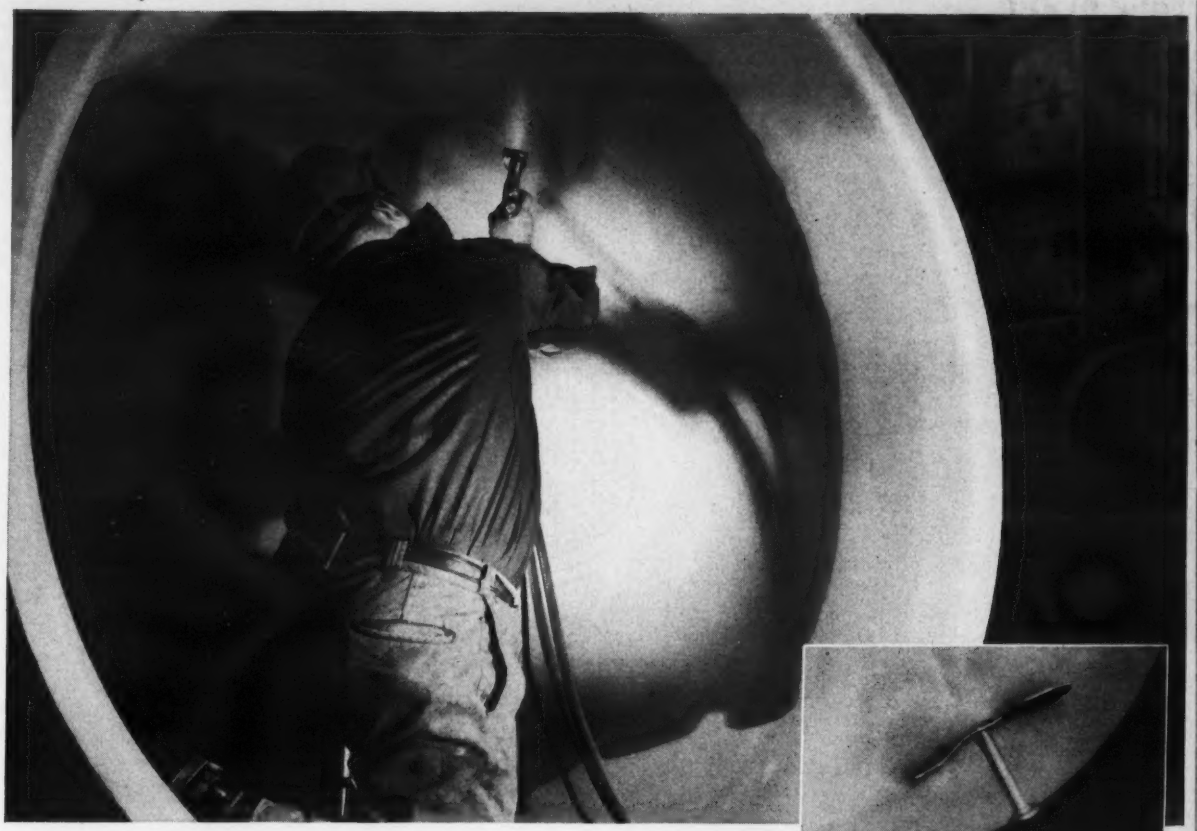
According to coating manufacturer, airless-spray application can result in savings ranging from 30 to 50% in materials and labor. Other advantages claimed are a pinhole-free, dried film; longer shelf life, and improved chemical resistance over full pH scale. The coatings can be used over any one of manufacturer's standard Tygon brand primers.

(Tygon AV-series, airless-spray vinyl coatings are product of Coatings & Linings Division, The U. S. Stoneware Co., Akron 9, Ohio.)

Check 5748 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

PENTON* at work: PFAUDLON 301



Pfaudlon 301 Stays On: Penton-coated agitator used to mix highly abrasive sandlike slurry in 3½% of 37% HCl in H_2O shows no visible corrosion after twelve months of steady production.

The modern corrosion barrier for process tankage

Pfaudlon 301 is the name of a water-suspension coating based on Penton which provides an economical way to protect equipment from the corrosive effects of direct product contact with corrosive fluids and atmospheres.

Resistant to more than 300 different chemicals and chemical reagents Pfaudlon 301-Penton coatings are hard, nonporous, glossy and smooth. They can be readily applied as an interior or exterior coating to such metals as mild steel, cast iron, stainless steels, Hastelloys, brass, bronze or copper.

Pfaudlon 301 coatings can serve on many kinds of equipment—storage tanks, open vessels, hoods, blowers, ducts, baskets, pump and pump parts.

Pfaudlon 301-Penton coatings can be supplied by Pfaudler on new process equipment, or applied on existing equipment as a custom coating by Pfaudler-licensed applicators in your area.

Pfaudlon 301 coatings are but one of the many ways in which Penton, the modern engineering thermoplastic, is now serving industry in combating corrosion of many types. Penton processing components of all types are now readily available. Write for your copy of "The Penton Buyer's Guide," a complete listing of suppliers of valves, pipe and fittings, pumps, meters, tank linings and coated parts made with this low cost, durable, and reliable corrosion barrier.



Simple as ABC. Send for The ABC's of Penton for Corrosion Resistance. *This bulletin rates Penton's performance at temperatures up to 250°F. when exposed to over 300 chemicals and reagents.*

*Penton is the Hercules Powder Company registered trademark for chlorinated polyether.

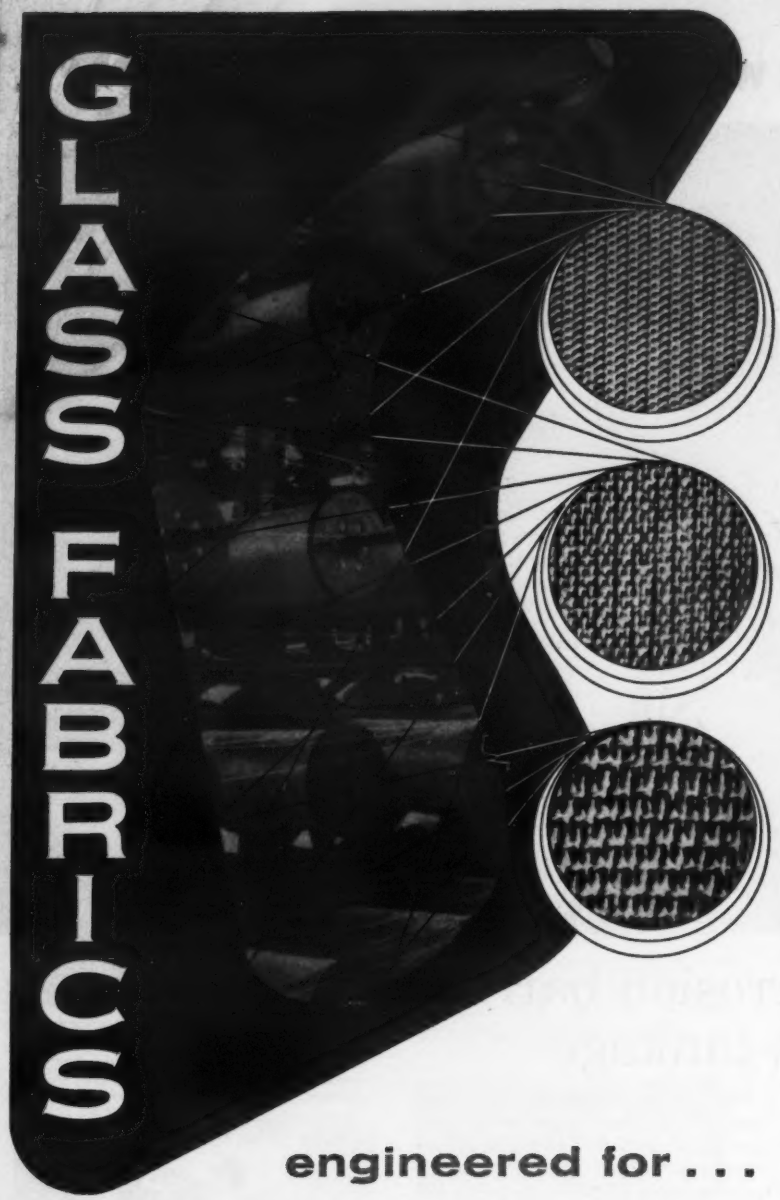
HERCULES POWDER COMPANY

Hercules Tower, 910 Market Street, Wilmington 99, Delaware

QP61-5

For information on Pfaudlon 301 coatings for new or existing process equipment, write: Pfaudler Permutit, Inc., Rochester, New York.

Check 5749 opposite last page.



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•HIGH TEMPERATURE DUST COLLECTION •INSULATION

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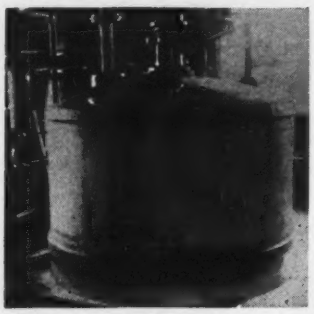
Check 5750 opposite last page.

Translucent reactors show product level at a glance

Uses: Processing and storing various chemicals.

Features: Glass-fiber reinforced plastic vessels are translucent and have molded-in, direct-reading gage for easy determination of liquid level.

Description: Units are available in 10 standardized diameters with capacities ranging from 50 to 70,000 gal. Corrosion-resistant and self-supporting, tanks are light in weight and easy to install.



Glass-fiber reinforced plastic processing vessel provides low cost protection against corrosion

Perforated sparge pipe used for aerating is fabricated of glass-reinforced plastic. Auxiliary equipment such as agitators or plate-type heating coils can also be made of corrosion-resistant materials.

(Plastic processing tanks are product of Jones & Hunt, Inc., Gloucester, Mass.)

Check 5751 opposite last page.

NEW LITERATURE
Corrosion Control

Polyurethane coatings are discussed in series of data sheets. Physical, chemical and corrosion resisting properties are reviewed in detail. Large number of suggested uses are given. Coatings are available in wide range of colors and are offered in three separate lines to cover various maintenance coating applications. "Ureflex" tech data sheets — Harrison Development Company.

Check 5752 opposite last page.

Economical brick floor installation is reviewed in four-page bulletin. Information regarding preparation of corrosion-resistant and wear-resistant joints to reduce floor maintenance is included. Also covered are money-saving procedures and techniques for installing new brick floors and repairing existing ones. Bul E-27b — The Master Builders Company

Check 5753 opposite last page.

Polyethylene scrubbers for handling corrosive fumes, vapors and dusts are topic of four-page bulletin. Applications, construction and operation details are given. Tables list dimensions and prices for various size scrubbers. Scrubber Bul — American Agile Corporation.

Check 5754 opposite last page.

Corrosion resistant kettles made of stainless steel, nickel and monel are detailed in four-page bulletin. Data, including specifications, are presented on the following types: stationary, trunnion-mounted; trunnion-mounted with worm or hydraulic lift; pressure kettles; and pressure cookers. Bul LM-100 — Lee Metal Products Co., Inc.

Check 5755 opposite last page.

PVC ball valve for solving corrosion problems is illustrated and described in four-page brochure. Valve has Teflon seat rings, Viton O-rings and can be furnished with either socket-weld or threaded ends. Sizes from ¼ to 4" are available. PVC Ball Valve—Walworth Company.

Check 5756 opposite last page.

Translation of German article on resistance of various steels to hydrogen at high pressures is available. Article is based on information developed at Material Testing Laboratories of Badische Anilin und Sodafabrik, Ludwigshafen, and includes data on many German steels heretofore virtually unknown in the U.S. German Steel Reprint — Climax Molybdenum Company, division of American Metal Climax, Inc.

Check 5757 opposite last page.

Kanigen process for depositing corrosion-resistant, nickel alloy coating on iron, copper, aluminum, titanium and their alloys without use of electricity is discussed in 12-page technical bulletin. Three pages of tables list commodities and test conditions under which the chemically-deposited nickel plating is considered suitable. Tech Bul 561 — Kanigen Division, General American Transportation Corporation.

Check 5758 opposite last page.

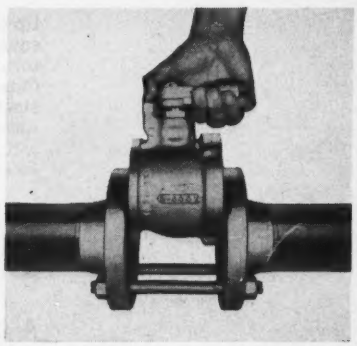


A 3" Econ-O-Miser Ball Valve Controls Abrasive Slurry at Pantasote Company

The combination of several unique design features of the Flange Econ-O-Miser Ball Valve helped solve a troublesome problem at Pantasote Company, Passaic, New Jersey, makers of polyvinyl chloride resin. This fluid, actually a granular solid slurry, required a valve with a wiping action. With the Econ-O-Miser design, the ball is wiped clean by the seats each time the valve is operated eliminating the danger of binding or of trapping solid material. A ball valve was selected over a gate valve because the ¼ turn feature allows operation from the floor by using a lever, and the position of the lever indicates whether the valve is open or closed.

The body of the Econ-O-Miser ball valve mounts directly on the flange of the vessel, without the usual flange pipe end. This eliminated any dead space where "puddling" could effect the reaction. Econ-O-Miser Ball Valves can provide similar installation advantages, superior performance, and substantial dollar savings for you!

Econ-O-Miser Flange Ball Valve . . . 3" Size Illustrated. Size Range . . . ¼" through 6". Seat and Seal Materials . . . Buna-N, Teflon and Neoprene. (Other Materials Available.)



For more information on product at right, specify 5759 see information request blank opposite last page.

Write for complete technical information, or contact your local Worcester stocking distributor!

WORCESTER VALVE CO., INC.

17 PARKER STREET, WORCESTER, MASS.

ideas and news:





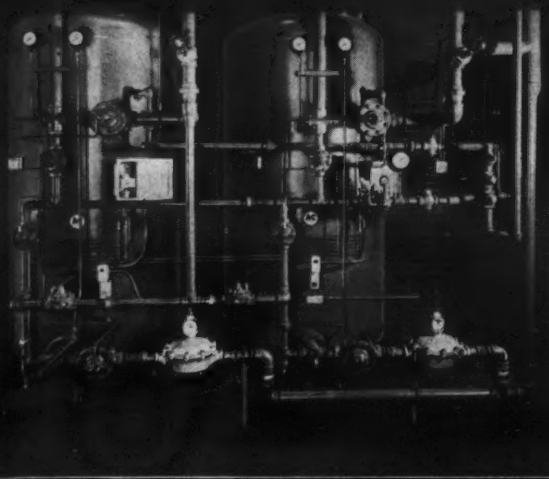
Up to 35 square feet of screening area in only 16 square feet of floor space: Stacked-deck design of this gyratory screen conserves valuable space. Cuts maintenance, downtime with all-stainless-steel construction. Abrasive or corrosive materials, dry foods and pharmaceuticals are handled with care. Gentle, quiet, vibrationless operation means minimum disintegration of fragile particles.

Silicon rectifiers can be located anywhere in the plant. Designed especially for large electrochemical or industrial applications where space, heat or dirty atmospheres are a problem, these silicon rectifiers employ water-to-water heat exchanger equipment. No special room is required — no need for clean air for cooling. Smaller compartment sizes save floor space. Cells can be removed without disturbing the cooling system. Reactor cores eliminate need for matched cells, surge capacitors protect against voltage surges, and current-limiting fuses provide cell protection.

Which of these productive ideas could be working for you?

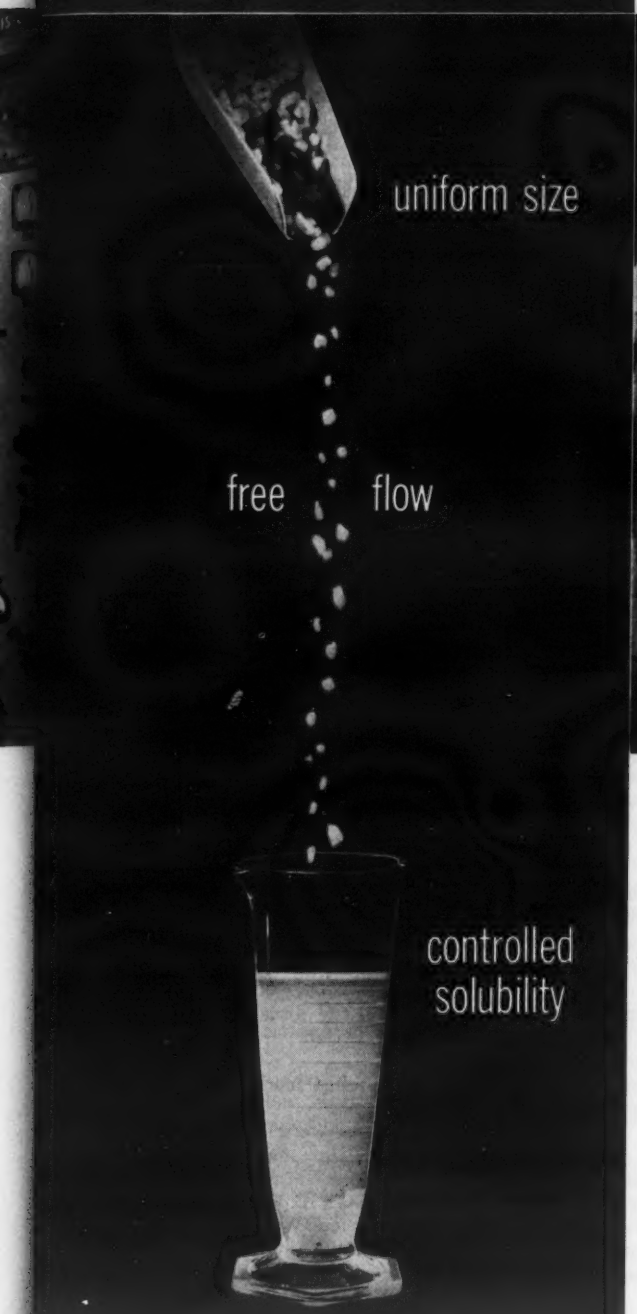
A continuous mechanical agglomeration process that makes waste materials pay. A steam turbine-generator with dual-purpose flexibility. A gyratory screen that saves space. These examples demonstrate the extra value that is standard with Allis-Chalmers . . . the greater efficiency and the added productivity which are yours when you buy A-C products, systems and services. Call your Allis-Chalmers representative for details on A-C "worth-more" features. Or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.

Compactor is an Allis-Chalmers trademark. A-1480



Calcium and magnesium are the "vandals" that cause scale in pipes and boilers, clog systems and mean heavy use of cleaning compounds. ZEOLITE is their natural enemy! An A-C zeolite water softener means a simple switch to sodium ions from the usual hardness present in most water supplies. Once A-C conditioned, the "softened" water finds ready use in chemical plants to end scaling problems.

Even the by-product makes an economy contribution: Versatile . . . describes these two 6250-kw condensing, automatic extraction steam turbine-generator units installed in a midwest petrochemical plant. A typical application supplying steam to a process with electric power as an economical by-product. A-C manufactures a complete line of condensing and non-condensing turbine-generator units, with or without automatic extraction, for the chemical industry. For complete information on types and ratings from 2000 kw to the largest, ask for bulletins 7654A and 9448.





Profit recovery starts with waste: The continuous mechanical compacting process recovers virtually 100% of waste fines! It compacts and screens your waste material into flakes. Then granulates them into desired product. The same process tightens your production controls when you face problems involving granular size, density, solubility and other physical properties. Integrates smoothly into your system. Requires less power, lower capital investment than less modern agglomeration methods.

ALLIS-CHALMERS PRODUCTS FOR THE CHEMICAL INDUSTRY: Look to A-C for atomic, thermal and hydro electrical generating equipment; Compactor mills; compressors; control; coolers; crushers; dryers; earth-moving equipment; engines; grinding mills; industrial systems; kilns; lift trucks; motors; pumps; rectifiers; screens; switchgear; tractors; transformers; unit substations.

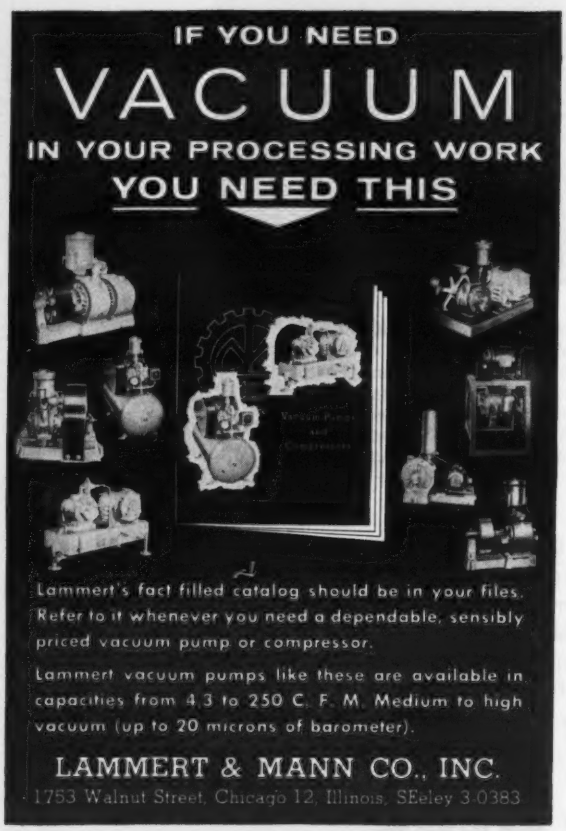
ALLIS-CHALMERS



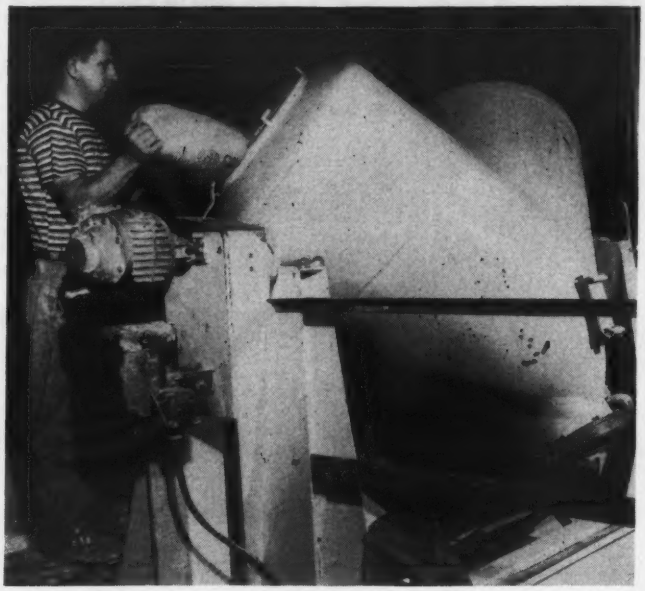
EASTERN INDUSTRIES, INC.

Mixer Division, Dept. P, Norwalk, Connecticut

Check 5761 opposite last page.



Check 5762 opposite last page.



Twin-shell blender being charged with ingredients for manufacturing floor-tile mix. Unit is equipped with liquid-feed intensifier bar, which permits accurate addition and dispersion of moisture in the product

Tile-mix processing time cut over 90 percent

Twin-shell blender replaces multi-step process, accomplishes in minutes what used to take days

Problem: Manufacturing ceramic floor tile mix was a slow and cumbersome process at Wenczel Tile Co., Trenton, New Jersey. It took five days to turn out a 5000-lb batch. Excessive manual material handling operations were involved. Also, rigid operator attention was required to insure the output of uniform-quality product.

A NEW SOLUTIONS FEATURE

Ingredients used in the process are nepheline, china clay, ball clay, flint, talc, coloring agents and water. Operations included grinding, blending, filtering, and drying.

Eight hours were needed to make up, load, mill and unload a batch of slurry. This was followed by filtering and three days of drying in tray-type units. Cleaning the mills, filter presses, dryers and auxiliary equipment consumed another eight-hour day.

Solution: In an effort to streamline operations and boost the overall efficiency of the process, company investigated other methods of production. Among the equipment studied was a rotating, twin-shell, liquid-solids blender.

The unit is essentially two cylinders cut at an angle and rejoined to form a V-shape. Inside the machine, immediately under the apex of the "V", is a liquid-feed, intensifier bar powered by a separate motor.

The liquid-feed device permits exact quantities of liquids to be added to solids at controlled rates. It consists of a hollow cylindrical bar revolving inside the blender shell. Liquid flows from a feeder tube within the bar, onto revolving distributing discs. By centrifugal force, the discs feed liquid continuously into the material being processed in the blender. "Dog ears" on the discs provide intensified blending action.

Pre-tested Four Months

Arrangements were made to conduct trial runs at the manufacturer's pre-test laboratory in a small, eight-quart-capacity machine. Experiments covered a four-month period. Wenczel provided the raw materials, blending formulations and necessary supervisory personnel. Based on experience with similar materials,

equipment engineers established optimum timing and blending procedures for the specific application.

The objectives of the tests were to obtain precise blending and to achieve uniform color dispersion. A major obstacle during the initial runs was the appearance of white specks in the finished mix. However, these were eliminated by intensifying the premix cycle, which was achieved by establishing 3100 rpm as the best speed for the liquid-feed bar.

The tests showed that the twin-shell blender could easily slash production time — and improve the finished product as well — by eliminating most of the previous time-consuming operations. Consequently, a 20-cu-ft-capacity, production-size unit was installed at the Wenczel plant.

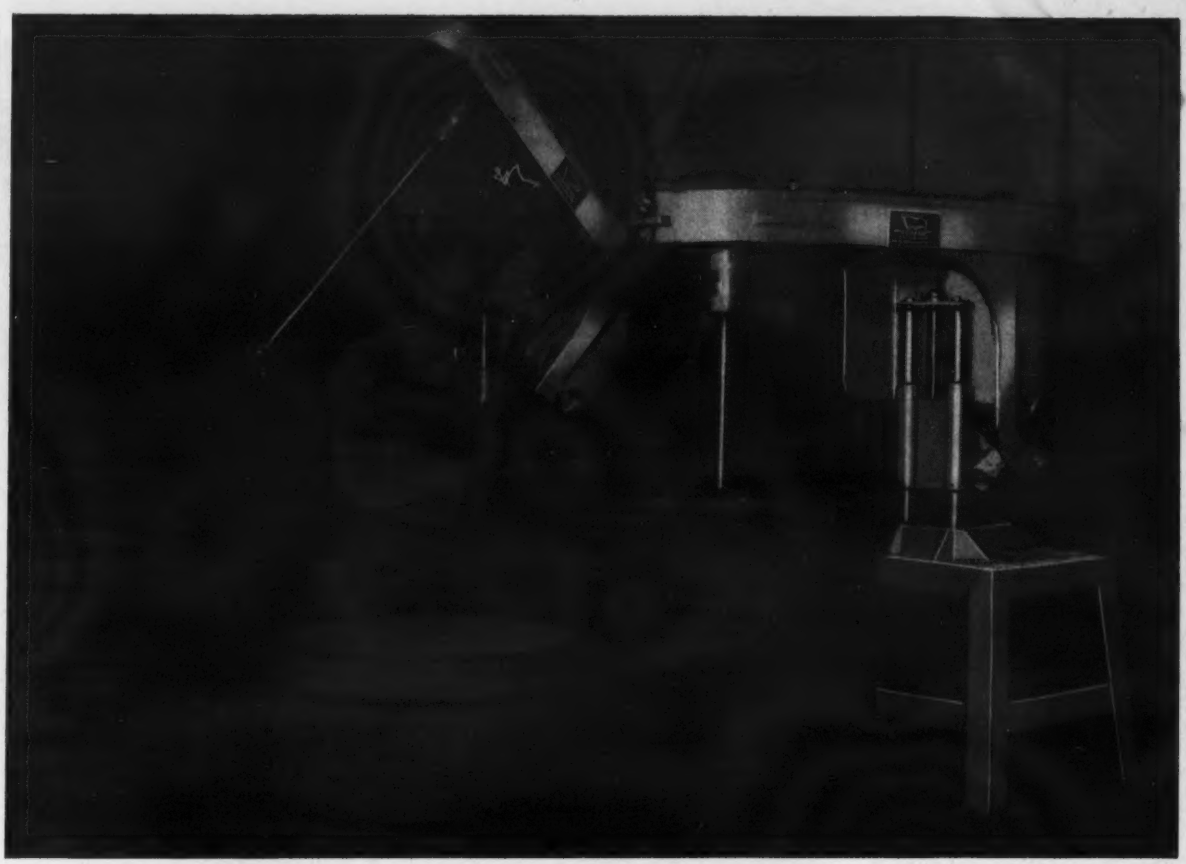
Results: The new blender turns out 800 lb of 150-mesh-particle-size, finished mix in 28 minutes. All the desired results are achieved in this single piece of equipment. Seven batches, or 5600 lb, require less than four hours — compared to five days for 5000 lb by the old method. Production time has been cut by over 90%.

The 28-minute cycle is broken down as follows: seven minutes loading, 10 minutes intensive dry blending, two minutes tumbling to further break down particles, two minutes for the addition of water through liquid-feed bar mechanism, five minutes intensive mixing and another two minutes for final blending.

All the dry ingredients are simply charged to the unit without need for any other size reduction. Gone are the space-consuming mills, filter presses and tray dryers. Excess material handling steps have vanished.

As stated before, the liquid-feed intensifier bar permits accurate metering and dispersing of water into the mix. This is extremely important since the addition of water has a direct bearing on final strength of tile and its shrinkage during final firing process.

Where previously excess



"COWLES DISSOLVER" equipment + "HERCULES" *cubed* nitrocellulose = "one-two punch" for Gilbert Spruance Co.

R. L. Colvin, Superintendent of the Gilbert Spruance Co. of Philadelphia, well-known manufacturer of paint, varnish and wood finishing products writes—"Our customers must have the fastest possible service, due to the nature of their business."

"In dissolving nitrocellulose we have found that unless proper agitation is used to disperse the nitrocellulose, it will settle rapidly to the bottom of the tank, thus taking considerably more time to obtain proper dispersion. This is when the Cowles Dissolver plus Hercules "cubed" nitrocellulose gives us our one-two punch.

"This combination allows us to charge the mixer quickly and also secure fast dispersion due to the characteristics of the material and the high shear agitation of the Cowles Dissolver. As a result, our mixing time has been reduced considerably, thus permitting us to give the service our customers require."

Cowles high-speed, high shear dissolvers are efficient in producing fast, economical ultimate dispersion, deagglomeration, dissolving and disintegrating of a wide variety of products. Materials with viscosities up to 50,000 centipoises or more are easily handled, including adhesives, chemicals, inks, foods, paints, etc. The patented impeller with the teeth that make the BIG difference and the exclusive MPD* drive that delivers plenty of power even at slowest speeds assure you of finest quality end products at lowest cost.

*Trademark

Let us prove it in your plant at our risk! Write today for more complete information.

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1150 San Fernando Road, Los Angeles 65, California
Convenient lease and time-payment plans. Representatives in principal cities.

415

COWLES DISSOLVER®

Check 5763 opposite last page.

moisture (60%) was required to produce a workable slurry, only the final desired amount (9%) is added now. This results in a much lower density, easier-to-process mixture, and accounts for the elimination of the other operations.

(Twin-shell, liquid-solids blenders are product of The Patterson-Kelley Co., Incorporated, East Stroudsburg, Pennsylvania.)

Check 5764 opposite last page.

Up to 4000 lb per hour quicklime processed by pug mill slaker

Unit operates continuously, needs little attention

Uses: Continuously converting any commercial grade of calium oxide and quicklime into paste calicum hydroxide, slaked lime.

Features: Pug mill slaker can process up to 4000 lb per hour. Homogeneous mixture of completely slaked lime and water is insured because the operation is performed in progressive stages while mixture moves through unit.

Description: Quicklime is fed into unit by feeder mounted directly above it. Separator chamber, control console, agitator rods, grit removal unit, dust and vapor removal unit, internal electrical, hydraulic and mechanical systems are included in the main body.

Water is introduced by positive, direct-proportioning system. Slaked lime paste is discharged from slaking compartment by weir overflow and is immediately washed and diluted with spray jets in separate chamber.

Shipping weight of slaker without feeder is 3500 lb. Maximum water requirements are 53 gpm at 60 psi. Overall size of unit is 116 x 46 x 50" high.

(Further information about Model 42-03 pug mill lime slaker may be obtained from B-I-F Industries, P. O. Box 276, Providence 1, Rhode Island.)

Check 5765 opposite last page.

FLUIDICS* AT WORK



Pfaudler factory inspector electric-tests **Nucerite** bayonet heater (6⅝" dia. by 68" long) designed for experimental use in high-temperature sulphuric acid environment.

Progress report:

NUCERITE moves into limited production

Now, there is a practical way to cope with a broad range of corrosives in the 500 to 1500°F temperature range.

It's Pfaudler® Nucerite,* a recently developed family of ceramic-metal composites that resist corrosion at these high temperatures.

Various formulations of Nucerite have undergone field testing on a wide scale since this group of materials was introduced last year. Results indicate many practical applications for Nucerite in the 500 to 1500°F range. Very few materials available up till now would withstand these temperatures, and even then only under extremely limited conditions.

Limited production. Where field tests or lab data substantiate the serviceability of Nucerite in a given application, Pfaudler now accepts orders for production equipment of simple shape, rounded corners, and uniform cross section.

Successful tests. You can get some idea of the range of applications for Nucerite from this representative list of successful field tests:

1. Metal halides at 1292°F (a specialty alloy failed in this service in 2 to 3 weeks).
2. Cl_2 and CCl_4 mixture at 600°F (a quarter-inch stainless steel piece corrodes through in a matter of minutes).
3. Refractory metal chlorides at 485°F.
4. Coal tar pitch at 750°F (solid ceramic materials previously used failed here due to thermal shock).
5. Aqua regia plus heavy abrasive at 225°F (tantalum is the only metal which could withstand this condition).
6. HCl plus solids (100 f.p.s.) at 1112°F.

Nucerite equipment. Among the equipment for which orders have already been received, are the following: 6"-diameter pipe, 2½"-diameter boiler tube, 6⅝"-diameter bayonet heater (shown above), 12"- and 18"-diameter columns, finger baffles, and a 300-gallon "RA" series closed-top reactor.

Other characteristics. Nucerite offers the greatest potential in coping with corrosion at high temperatures. However, resistance to impact, abrasion, and rapid temperature change is also of importance for specific applications.

Data available may indicate which formulation of Nucerite can best solve your particular problem. If not, we invite your participation in a field evaluation program.

For more information, write to the address shown on the facing page.

*Patent applied for



Only 10 days from here to your plant

That's the delivery story on selected Pfaudler Glasteel reactors.

In standard sizes and assemblies you can get the reactor you need, shipped to your plant, just 10 days after receipt of your order.

This "off-the-shelf delivery" applies to completely assembled Glasteel reactors in lab, pilot-plant and production sizes. Specifically, it covers the following: "P" series reactors in 30-, 50- and 100-gallon sizes; "E" Series in 200-, 300- and 500-gallon sizes; and "RA" series in 500-, 750-, 1000- and 2000-gallon sizes.

Complete specifications for these reactors are covered in Bulletins 927, 971 and 988, respectively.

Of course, all of these reactors bring you the many desirable features of Glasteel. Long life in corrosive service, since Glasteel is resistant to all acids (except HF) to 350°F and most alkalies at moderate temperatures. An essentially inert product-contact surface that protects purity, quality, and color. And a hard, smooth surface that resists build-up and is easy to clean.

When you need a reactor in a hurry, take advantage of the fast delivery and operational flexibility provided by Pfaudler's pre-stocking program.

In all, you can choose from 29 different standard models of Glasteel reactors, ranging in size from 1 to 4000 gallons. Normal delivery quoted, except as indicated here.

Write for free bulletins.

Why have wipers in an evaporator?

You'll find four wipers like this one in the Pfaudler Wiped Film Evaporator.

Their job: Wetting the entire evaporator wall with a *uniform*, thin film.

The result: High thermal efficiency and excellent heat transfer when you evaporate products that are heat sensitive, highly viscous, or low in thermal conductivity.

Free-floating, the blades are held in contact with the evaporator wall by centrifugal force. Note the slots—they



prevent curl and help accelerate product movement down and off the wall.

This gives you the best combination of full utilization of heat transfer area, an ultra-thin film for highest "U" values, and very short contact time at elevated temperatures.

The Pfaudler Wiped Film Evaporator is a high-capacity production unit, able to provide you with an evaporation rate of up to 50 lbs/hr/sq ft of heat transfer area, based on water.

Choose from standard models with 4 to 100 sq ft of evaporating area. If you need something larger, we'll fabricate on a custom basis.

Offer: Let us test your product at our Test Center. Or start by evaluating the data and specs in Bulletin 991.

Address all inquiries to our Pfaudler Division, Dept. CP-91, Rochester 3, N. Y. *In Canada, contact Pfaudler Permutit Canada Ltd., Toronto.*

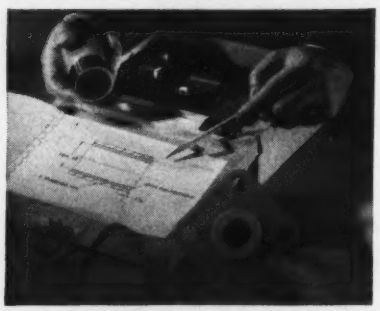
*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

Special gasket assures precise alignment for F-C Glasteel pipe*

This is the high-integrity glass-lined pipe that you can cut, thread, fire-polish and install right in the field. And to make sure that gaskets seat properly when you join sections, we've taken special precautions to assure precise alignment of the pipe axes.

Here's how: Flange bolt holes have been made *only* 1/16" oversize, rather than the conventional 1/8" oversize. In addition, the bolt holes in the gasket itself have also been made *undersize*. The gasket is thereby centered with the axial center line of the pipe and limits non-parallelism of the flanges.

Both the pipe and the gasket joints have been extensively tested — in the field and in our Test Center. For example, intermittent tests over a seven-month period were made with the following acids: 10% sulphuric, 10% nitric, and 20% hydrochloric. Pressures ranged



from 50 to 125 psi, with temperatures from 160 to 300°F. *There were no failures of either the glass lining or the gaskets.* Similar results have been reported for actual installations, including one of 850 feet, in operation since early last summer.

You'll find F-C pipe well suited to handling many "problem" liquids—corrosive, abrasive, and ultra-pure. It comes in 1½-, 2- and 3-inch diameters, with quick delivery on any length up to 10 feet. Write for Bulletin 987.

*Patent applied for

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid processes

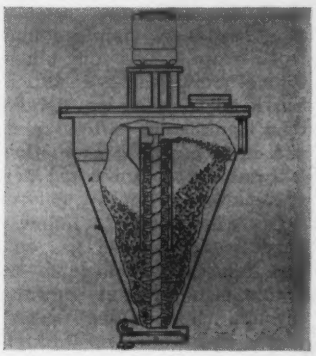
Check 5766 opposite last page.

Conical blender has lift-screw in center

Uses: Blending dry or liquid materials in chemical and allied industries.

Features: Conical design coupled with turbo-type dispensing blade and centrally-positioned lifting-screw provide maximum mixing efficiency in minimum space.

Description: Mixer consists of stationary conical shell equipped with a vertical-mounted lifting screw. Turbo-type dispensing blade distrib-



Blended product falls by gravity to bottom of cone where lifting screw brings it back up to top

utes particles at top of cone. Blended material falls by gravity to bottom where lifting screw picks it up and brings it back up to top of cone for repeat of the mixing cycle. Finished product is discharged through bottom outlet.

Machines are available in sizes ranging from 24 to 96" diam. Volumes vary from 2 to 185 cu ft. If desired, blenders may be jacketed for heating or cooling operations.

(Tur-Blend mixers are a product of Goslin-Birmingham Manufacturing Co., P.O. Box 631, Birmingham, Ala.)

Check 5767 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Wet-type scrubber cleans, cools gases; traps 99% of dust

Uses: Removing dust and fumes from gas and air streams. Unit may also be used for cooling gases emanating from wide variety of industrial processes.

Features: Scrubber has no moving parts. It can remove materials ranging from submicron to large micron sizes. On many types of dusts, efficiency is in excess of 99 percent.

Description: Wet-type scrubber's major components are shell; gas inlet; one or more stainless-steel, impingement baffle-plate stages; mist eliminator and clean-gas outlet. Single-plate unit can handle dust loadings up to 100 grains per cu ft. Liquid consumption is from one to three gal per 1000 cfm at 20 psi.

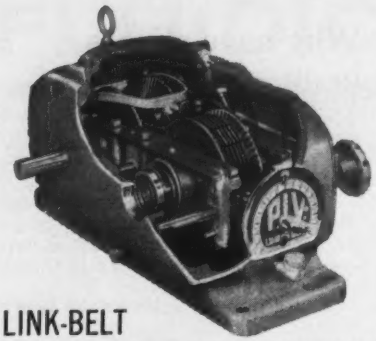
Operation is as follows: Dust or fume-laden gas enters through side inlet at bottom and passes upward through humidifying spray. Gas is then pulled up through



Single-stage scrubber has no moving parts, is designed for dust loadings up to 100 grains per cu ft

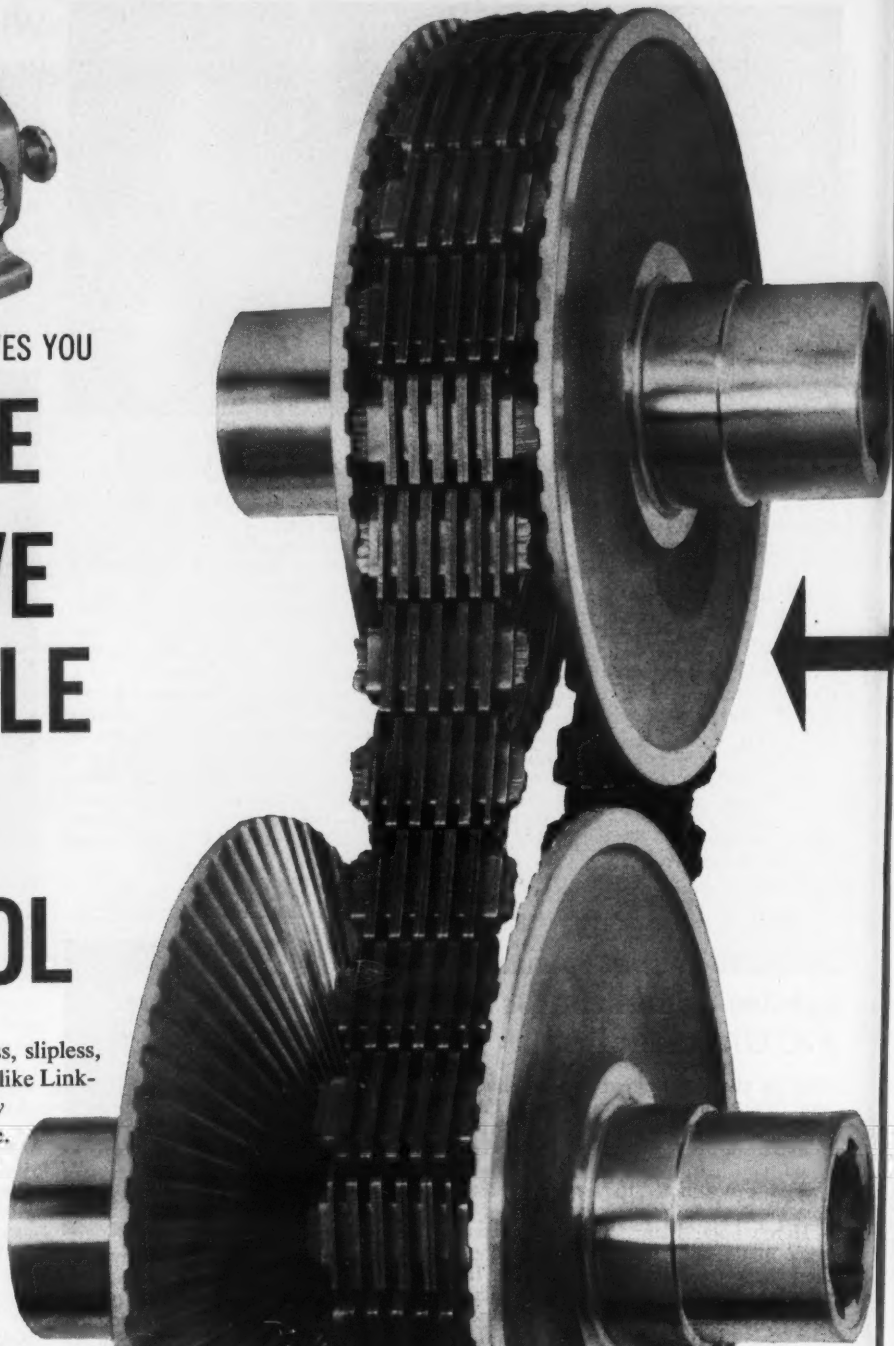
the perforated impingement plate where it is divided into thousands of individual jets (see drawing). At same time, these are exposed to water or other scrubbing liquid flowing over plate area.

Each jet stream strikes wetted, impingement surface. The plate is constructed so that there is an impingement baffle grid surface for each



LINK-BELT
CHAIN DRIVEN P.I.V. GIVES YOU

PRECISE POSITIVE VARIABLE SPEED CONTROL

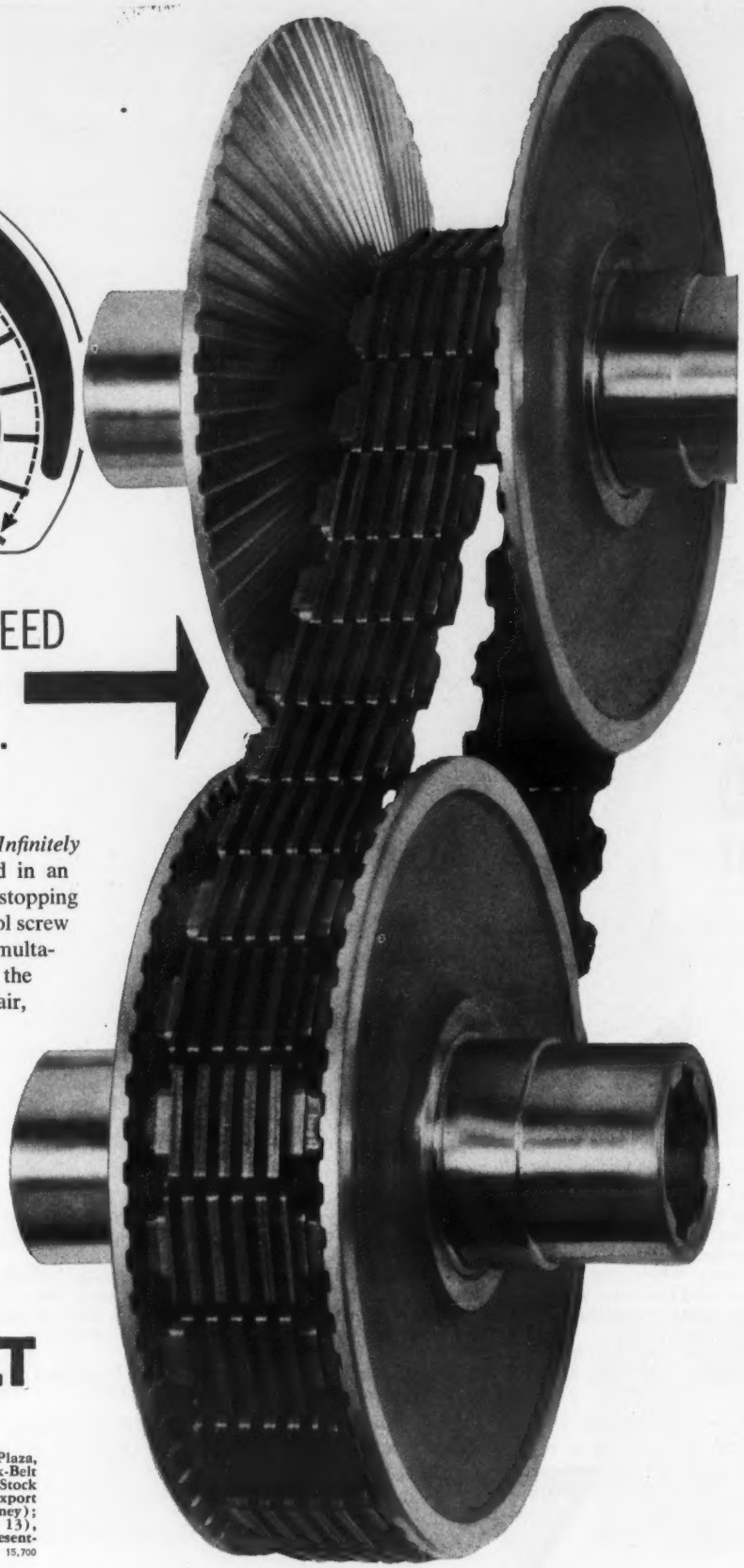


For operations requiring stepless, slipless, speed-changing, there's nothing like Link-Belt's P.I.V. . . . industry's *only chain-driven* variable speed drive. Unusual speed control accuracy results from P.I.V.'s unique design featuring *wheels and chain with teeth.* The two pairs of conical wheels act as gears . . . mesh with self-tooth-forming chain to assure positive contact under all speed and load conditions. Link-Belt's P.I.V. line includes 8 sizes and 16 standard types, capacities from ½ to 25 hp. Speed adjustments can be made manually or automatically with mechanical, hydraulic, pneumatic or electric controls. For full details, contact your nearest Link-Belt office or authorized stock carrying distributor. Look under POWER TRANSMISSION EQUIPMENT in the classified section of your local phone directory. Send for catalog.

P.I.V.®
LINK-BELT

FROM MINIMUM SPEED
TO MAXIMUM SPEED
NO SLIPS... NO STOPS...
NO STEPS IN BETWEEN

With a Link-Belt P.I.V.—*Positive, Infinitely Variable*—drive, speeds can be varied in an instant, regardless of load and without stopping the driven machine. A turn of the control screw changes the speed. The control screw simultaneously varies the effective diameters of the conically shaped wheels—closing one pair, spreading the other. This automatically, *instantly* adjusts the chain to provide a controlled output speed. Slippage? Not a chance—P.I.V.'s chain-to-wheel grip is positive as a gear.



LINK-BELT

P.I.V. VARIABLE SPEED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13), South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15,700

Check 5768 opposite last page.

hole. Dust is thoroughly saturated by bounding and rebounding against the numerous grid surfaces.

Sludge collects in lower portion of unit and can be removed through bottom drain. Clean gas passes up through mist eliminator and is exhausted at top of scrubber.

A single-plate unit can operate efficiently with pressure drop as low as 2½". For high dust loads, additional plates can be added.

(Impinjet scrubber is product of W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland 1, O.)

Check 5769 opposite last page.

▸ A NEW SOLUTIONS ARTICLE

Plugged in, turned on — Electric heater used to start NH_3 plant

Ammonia plant startup has been greatly simplified by the use of an electric heater. At Sun Oil Company's Marcus Hook, Pa., installation, a 400-kw unit is used to raise the temperature level of the catalyst bed to 700°F.

Basically, the ammonia synthesis process involves compressing nitrogen and hydrogen to 4200 psi and then passing the compressed gases over the catalyst. Since reaction is exothermic, outside heat is required only during startup. Transfer of energy from heater to catalyst bed is accomplished by passing synthesis gas over the 14-ft long heater.

In general, about 20 hours is required to bring the catalyst up to temperature. This is followed by a period in which the electrical input to the heater is gradually reduced and finally shut off entirely.

Heater operates on 440 volts. Input ranges between a starting rate of 100 amps to a maximum of 900 amps per hour. Level of input is controlled to provide uniform expansion of the heater and to avoid overheating.

(Radi-Fin heaters are product of Hynes Electric Heating Company, 708 Colfax Avenue, Kenilworth, New Jersey.)

Check 5770 opposite last page.



Typical Combination
Fluidized Bed Dryer & Cooler

YOU'LL FIND NO "HOT SPOTS" IN LOUISVILLE FLUIDIZED BED EQUIPMENT

Louisville Fluidized Bed units are meeting with unusual success as dryers, coolers and reactors for free-flowing granular materials up to ¼" particle size. Temperatures within the units are remarkably uniform. There are *no* hot spots. The high rate of heat transfer and the constant turbulence inherent in their operation create conditions that for all practical purposes are isothermal.

The operating range of Louisville Fluidized Bed Equipment is from 50° F. in the case of coolers to as high as 1500° F. in calciners and reactors . . . up to 2500° F. in special cases. By measuring and controlling exhaust temperatures, bed temperatures are maintained within narrow limits.

Response to desired changes is practically instantaneous. Because of this sensitivity to change, the critical temperature of the material being treated can be more nearly approached than in any other kind of dryer or reactor . . . as close as 2° F. in many operations.

For more information about Louisville Fluidized Bed Equipment, please write for Bulletin FBD-61

Process Equipment Division—Louisville Dryers

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street *Chicago 3, Illinois*

Check 5771 opposite last page.

▸ A NEW SOLUTIONS ARTICLE

Faster batch changes with hinged closure on reactor opening

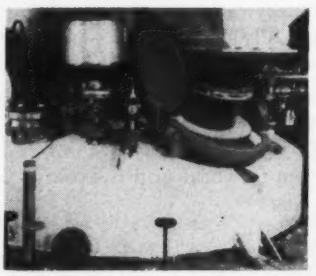
Unit can be opened or closed in a minute

Problem: Loading a 3000-gal reactor was a slow and awkward job at Jones-Dabney Company, Louisville, Ky., a division of Devoe & Raynolds Co., Inc. A big bottleneck was removing the cover from 18" opening at top of unit. Bolts had to be taken off by hand before the blind flange could be lifted out of the way.

The reactor is used to prepare urea formaldehyde and melamine resins for the production of lacquers, enamels, varnish and other industrial paint products. Cooking temperatures are up to 300°F, with vacuum as low as one inch.

Solution: The reactor opening was fitted with a spring-balanced hinged-closure. Factory assembled, the device was installed on the vessel with a single circumferential weld.

A two-piece yoke with self-locking tapers provides tight seal between head and hub of closure when the two yoke-



Batch charging is conducted in minutes by means of spring-balanced, hinged closure and conveyorized solids hopper on 3000-gal reactor

holding bolts are tightened. The hinged head, spring-loaded for counter-balancing, remains in position for instant closing following loading of a batch of material.

Closure head and hub are made of type-304L stainless steel to resist corrosion by solvents used in the process.

Results: The reactor can

now be opened or closed in about a minute. As soon as the batch is removed, a conveyorized solids hopper is placed into position to charge the next batch of raw materials — urea crystals or melamine powder. The entire opening, loading and closing operation is easily conducted by a single operator.

(Spring-balanced, hinged-closure was designed by Tube Turns Div. of Chemetron Corp., P. O. Box 987, Louisville, Ky.)

Check 5772 opposite last page.

No need to empty drum — mix contents thoroughly right inside of it

Uses: Mixing a variety of materials in 55-gal drums weighing up to 1000 lb.

Features: Machine permits products to be mixed in original shipping container with no need to remove cover.

Description: Mixer was originally developed for paint industry. According to manufacturer, material that previously required five hours for complete pigment dispersal using a conventional blender is now mixed in 20-30 minutes by the drum unit.

Using patented, rotary, oscillating motion, drum turns at 30 rpm. There is no vibration. Only one man is required to operate the unit. Power is provided by one hp, 60-cycle motor. Overall dimensions of



Drum is simply rolled onto unit and clamped in place. Rotary oscillating motion achieves efficient mixing without vibration

machine are 80″ x 44″ x 56″ wide. Shipping weight is approximately 2000 lb.

(Model-2155 Nimixer is product of National Industries, 1122 Lewis Street, Jackson, Mich.)

Check 5773 opposite last page.

How **SANDVIK** *Continuous* Belt Coolers Make Drum Types Old-Fashioned





Schematic view shows how Sandvik Steel Belt Water Bed Cooler operates. Solid steel band "floats" on water-bed tank of circulating water or other coolant. Coolant pressure assures 100% contact with bottom of belt.

Sandvik also has portable, experimental cooling units on which you can make small scale trials in your own plant.

The SANDVIK patented water-bed, steel-belt cooler gives you these advantages:

- **UNLIMITED COOLING AREA**—Belts up to 48" wide—any length.
- **CONTROLLED ZONE COOLING**—Water-bed under belt can be sectionalized to permit zone by zone control of cooling (or heating) rate.
- **CONTROLLED FLAKE THICKNESS** — Made possible by flat, horizontal surface of belt. For thicker material, side skirts can be applied at the belt edges.
- **UNIFORM COOLING**—Assured by total contact of coolant with underside of belt.
- **CONVEY WHILE COOLING** — Facilitates processing efficiency. Material can be discharged directly into crusher.
- **EASY SEPARATION**—Most materials cooled on the horizontal belt surface separate readily when belt curves around pulley, even without scraper blades.

SANDVIK STEEL, INC.

STEEL BELT CONVEYOR DEPARTMENT

1702 Nevins Road, Fair Lawn, New Jersey • SW 7-6200

Cleveland • Detroit • Skokie, Ill. • Los Angeles

SANDVIK STEEL BELT CONVEYORS

In Canada:
Sandvik Canadian Ltd.,
P.O. Dr. 1335, Sta. O.,
Montreal 9, P. Q.



SS-240

MANUFACTURERS OF STEEL BELT CONVEYORS FOR OVER 40 YEARS

Check 5774 opposite last page.

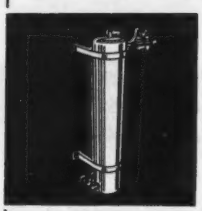
For more information on product at left, specify 5775 see information request blank opposite last page.

DEIONIZED WATER

—from equivalent of distilled to 18 megohm quality

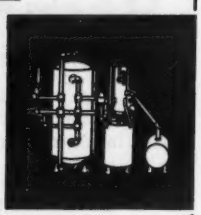
—from smallest laboratory to largest plant need

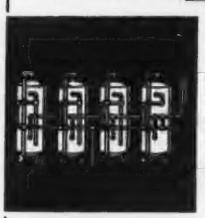
with these
ELGIN DEIONIZERS:



JUNIOR 120
Small mixed-bed type has exchangeable refill —delivers up to 2 gpm.
Ask for Bulletin 513

ULTRA-DEIONIZER
Large mixed-bed type delivers water of high quality in any quantity.
Ask for Bulletin 512A





MULTI-COLUMN
Any combination of anion and cation exchangers in sizes to meet any need.
Ask for Bulletin H4

Whatever the purity of water you need or the quantity you desire, Elgin can supply the correct type and size ion exchange equipment to deliver it. No requirement is too small—none too large for Elgin to handle efficiently. Whether it is a standard deionizer or one specially designed for the job, you are assured of expertly engineered equipment and trustworthy service for which Elgin has been known more than a half century.

The technical assistance of the nearest Elgin representative is as close to you as your phone.

Call or write for bulletins.

ELGIN SOFTENER CORPORATION
180 N. Grove Ave., Elgin, Illinois
Representatives in Principal Cities
In Canada: G. F. Sterne & Sons, Ltd., Brantford

Check 5776 opposite last page.



Self-cleaning centrifuges have upped output at Bristol Labs by boosting production runs from eight up to 72 hours

▶ A NEW SOLUTIONS ARTICLE

Staphcillin production boosted with centrifuges that clean themselves

Separate three components fast, simultaneously

Problem: Manually-cleaned centrifuges necessitated frequent shutdowns at Bristol Laboratories, Syracuse, New York. Used to remove solids and separate antibiotic broth and solvents, units had to be stopped at least once every eight hours to clean the centrifuge bowls.

Accumulated solids were removed by hand, which was slow and cumbersome. Frequent shutdowns also interfered with production, since processing for the most part is conducted 24-hr per day, seven days a week.

Solution: When the plant set up its new line for producing Staphcillin (sodium 2,6 dimethoxphenyl penicillin), self-cleaning centrifuges powered by 25-hp motors were installed. The machines permit all three components of the pharmaceutical emulsion to be continuously and quickly discharged, while unit is operating.

How it works

Feed enters top of machine, traveling down inlet tube into the spinning bowl. Mixture is then forced up through distribution holes into spaces between discs, where it undergoes separation by centrifugal force.

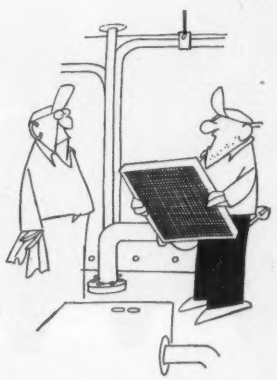
Solids are thrown to outside, against bowl wall, and are continuously discharged through nozzles built into the bowl. Heavy liquid leaves centrifuge from spout in middle. Light fluid is forced upward and out through top exit.

Results: The self-cleaning centrifuges enable Bristol to process three times more product with less units than were required in the previous set up. The amount of floor space and manpower needed is also less. Two man can adequately supervise and maintain the operation.

Production runs for centrifuges have been boosted from eight hours up to two or three days. The only time that the machines are shut down for any significant period is during changeover from one antibiotic to another. The new line was especially designed to allow flexibility in the production of more than one specific antibiotic. Changeovers necessitate thorough cleaning of lines and equipment.

(AC-VO-3 Nozzlematic centrifuges are product of De Laval Separator Company, Poughkeepsie, New York.)

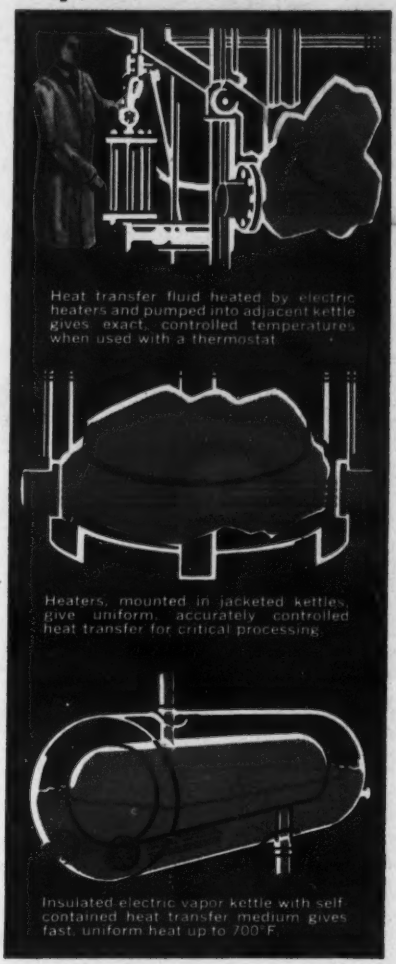
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"I couldn't find an 80-mesh screen, so I put it through a 40-mesh screen twice."

Idea by Walter H. Dittrich, Reichhold Chemicals, Inc.

CHROMALOX
Flange-Type, Electric
IMMERSION HEATERS
For hard-to-contain Liquids and Gases



Chromalox Flange-Type Electric Immersion Heaters are quick, economical solutions to heating compressed air and other gases, for super-heating steam and for heating liquids of all types of heat transfer mediums.

They are ideal for high-temperature/high-pressure applications and for use in corrosive solutions. Chromalox Immersion Heaters provide exact temperatures and maintain these temperatures when used with thermostats. Standard heaters furnished with 150 psi flanges, special flanges withstand up to 4500 psi.

GET THE FACTS. See for yourself how Chromalox Immersion Heaters can help improve efficiency and/or decrease costs. Write for catalog 60.



For more information on Chromalox products consult 1961 Chemical Engineering Catalog, pages 1007-1110

W1-25

CHROMALOX
ELECTRIC HEAT
EDWIN L. WIEGAND COMPANY
7517 Thomas Blvd., Pittsburgh 8, Pa.

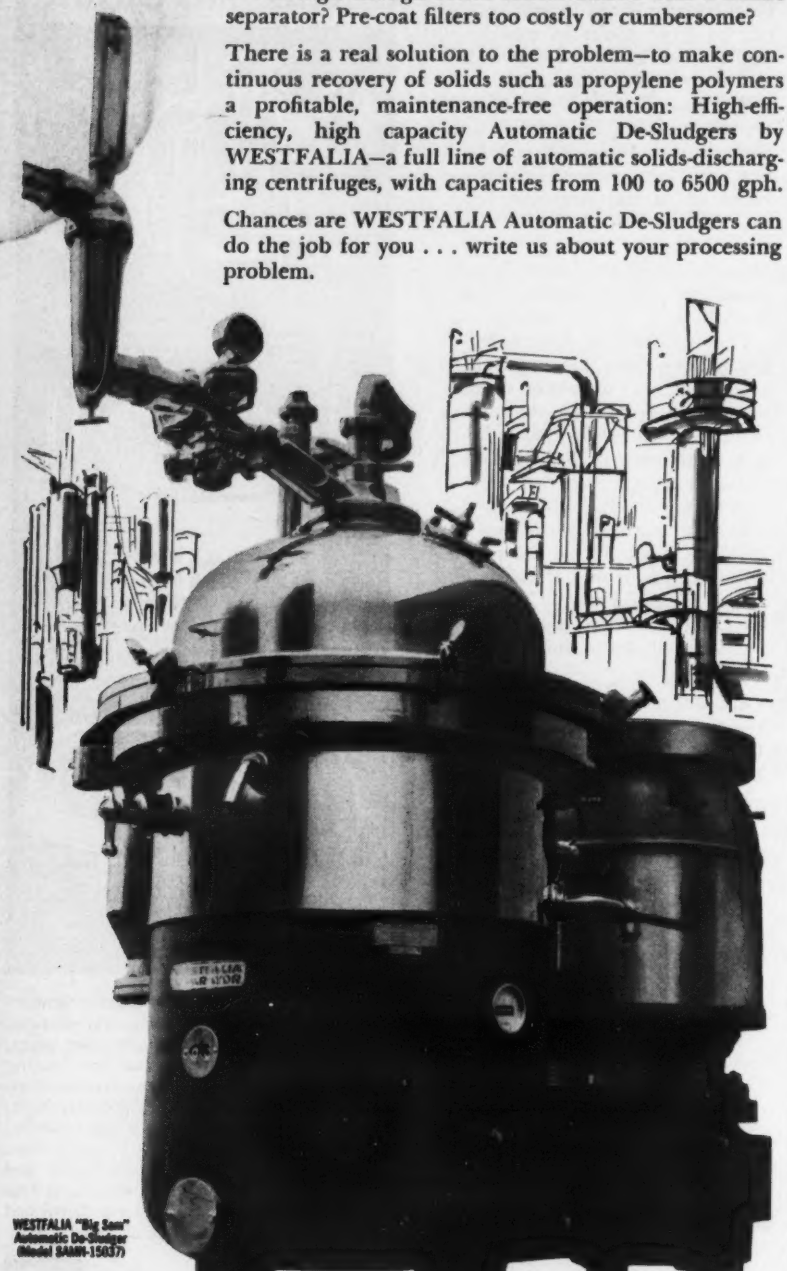
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SOLIDS RECOVERY PROBLEMS?

Not getting high clarification efficiency with a decanter . . . or high enough solids concentration with a nozzle separator? Pre-coat filters too costly or cumbersome?

There is a real solution to the problem—to make continuous recovery of solids such as propylene polymers a profitable, maintenance-free operation: High-efficiency, high capacity Automatic De-Sludgers by WESTFALIA—a full line of automatic solids-discharging centrifuges, with capacities from 100 to 6500 gph.

Chances are WESTFALIA Automatic De-Sludgers can do the job for you . . . write us about your processing problem.



WESTFALIA "Big Sam" Automatic De-Sludger (Model SAMH-15037)

SEE WESTFALIA AUTOMATIC DE-SLUDGERS AT BOOTH 843, CHEMICAL EXPOSITION, NEW YORK COLISEUM, NOV. 27-DEC. 1

WESTFALIA SEPARATOR

CENTRICO INCORPORATED

75 WEST FOREST AVENUE, ENGLEWOOD, N. J. • Phone LOWELL 9-0755
WESTERN DIV.: 3315 CAXTON COURT, SAN MATEO, CALIF. • FIRESIDE 5-7065

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PROCESSING EQUIPMENT

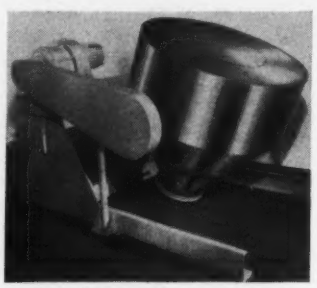
Better dispersing action assured by screens in tumbling blender

Minimize particle breakage, speed processing cycle

Uses: Mixing and blending dry solids.

Features: Machine revolves end-for-end on a trunnion. Unit's design provides for gentle, efficient dispersing action with minimum particle breakage.

Description: Rapid and complete interchange of solids is performed by means of perforated screens mounted radially inside unit's conical bottom. Holes in screens cause numerous flow patterns to be set up with each revolution of the blender. Screens are available with ½, ¼, ⅛ and 1/16" slots.



All-welded stainless steel construction permits broad use for this tumbling-type blender

Standard machines are furnished with 5-7 rpm drives. Construction of blender is all-welded stainless steel. Optional dual, positive-action, hydraulic raising and lowering device permits loading or unloading at floor level.

Manufacturer has 10-qt laboratory unit available for test purposes.

(Strata screen mixer is product of Hobam, Inc., Box 91-139, Buffalo 17, New York.)

Check 5780 opposite last page.

Permanent magnetic filters for removing tramp iron and other ferrous contamination from flow lines are pictured in four-page brochure. Units can be used for either wet or dry materials. "Magnetic Filters" — Magni-Power Co.

Check 5781 opposite last page.

Highly Intimate Blends in 1 to 2 Minutes

Blends while discharging; No segregation or flotation

Sturtevant Rotary Blenders start 4-way blending while charging, continue it during discharge, thus producing highly intimate, even blends of dry and semi-dry materials – within 3 to 5 minutes of start of charging.

Six *complete* blending cycles per hour are common. And Sturtevant's special action produces no particle reduction, cleavage or attritional heat – is highly effective yet gentle and safe even with explosives.



Receiving

Scoops cascade material as drum rotates. Movement forces material from both ends to middle. Thus blending is 4-way right from start of charging.



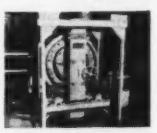
Discharging

Single gate controls charge, discharge. Blending continues throughout discharge phase. Result is no segregation or flotation — highly intimate, even blends.

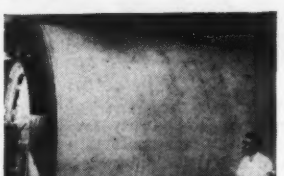
Self-cleaning, dust-sealed drum; one-man accessibility

Operation of Sturtevant Blenders is self-cleaning – drum interiors are completely dust-sealed. For inspection of all models, one man simply loosens a few lugs to remove manhole cover – quickly and easily.

Nine standard models with capacities to 900 cu. ft.



10 cu. ft. Sturtevant Blender at U.S. Steel Corp.'s new Applied Research Laboratory (Raw Materials Division) in Monroeville, Pa. This unit handles batches up to 500 lbs. — is ideal for pilot work and small runs.



One of four 450 cu. ft. Sturtevant Blenders at Celriver Plant of Celanese Corp. (Rock Hill, N. C.). These large units handle up to 20,000 lbs. batches — have a 9-year record of meeting the most exacting blending requirements.

Fully or semi-automatic, or manually controlled operation

Constructed of carbon steel, stainless steel or Monel metal, Sturtevant Rotary Blenders are engineered to fit each customer's needs – can be supplied with injector sprays and any desired control system.

For more on Sturtevant Blenders, request Bulletin No. 080B. (Bulletins also available on Mixers, Air Separators, Micronizers, Crushers and Grinders.) Write today. STURTEVANT MILL CO., 119 Clayton St., Boston, Mass.

Check 5782 opposite last page.

NEW LITERATURE

Processing Equipment

Centrifugal contactors and solvent extractors are presented in 24-page brochure. Operating principle of these countercurrent, liquid-liquid and vapor-liquid machines is described with the help of illustrations and diagrams. Brochure P-100 — Podbielniak, Inc., Division of Dresser Industries, Inc.

Check 5783 opposite last page.

Cone crushers featuring instant hydraulic adjustment are reviewed in four-page bulletin. The 22 and 30″ units have feed openings up to five inches and capacities to 68 tph. Cutaway diagrams and drawings illustrate operation. Bul 17B9923 — Allis-Chalmers Manufacturing Company.

Check 5784 opposite last page.

Sixteen models of quick-opening doors for pressure vessels are shown in six-page brochure. Doors are made in one to 15 ft diam and withstand pressures from full vacuum to 3000 psi. Bul "Quick-opening Doors" — Biggs-United Division of United Sheet Metal Co., Inc.

Check 5785 opposite last page.

First U. S. application of gravitational-inertial classifier is told in two-page technical reprint. Unit has no moving parts and separates fine dust from crushed material at Warner Co., Bellefonte, Pa. Classifier Reprint — Buell Engineering Co., Inc.

Check 5786 opposite last page.

Pug mill that can convert up to 4000 lb per hr of commercial-grade calcium hydroxide and quick lime into paste calcium hydroxide, slaked lime is discussed in three-page bulletin. Photos and engineering specifications are included. Bul No. 42-03.201 — B-I-F Industries.

Check 5787 opposite last page.

Mechanical air separators are topic of 16-page, two-color bulletin. Detailed diagrams and pertinent technical data are included. Bul 90 — The Raymond Division of Combustion Engineering, Inc.

Check 5788 opposite last page.

Ball and rod mill specification manual reviews full line of grinding equipment. Specifications for each mill are listed. Case history information is also included. Numerous engineering tables and valuable technical data are presented. Specification Manual — Denver Equipment Company, 1400 17th St., Denver 17, Colo.



72...48...150! Obviously, these statistics are not the young lady's. They belong to the Glas-Col electric heating mantle specially designed for a Pfaudler 150-gal. glass-lined steel kettle. Pfaudler Permutit, Inc., Rochester, N.Y., offers optional standard Glas-Col mantles on its process equipment—providing several distinct advantages.

Mantles provide lower initial cost than jacketing because they eliminate heavy investment in auxiliary preheating equipment, pumps, piping, heating medium and installation labor. Glas-Col controlled multi-zone heating provides heat only where needed—no superheating of bare vessel walls. Nor can they cause explosions, such as occur when concentrated acid mixtures accidentally mix with a hot heat transfer medium.

Glas-Col mantles are invaluable where steam or other heating mediums are not available, where higher-than-steam temperatures are required, and in the laboratory where accurate control of distillations or fractionations are needed. One more point—heat applied with a Glas-Col mantle never disturbs glass lining. Write for technical data or outline your specific heating problem.

Glas-Col Apparatus Company

Dept. CP, 711 Hulman Street, Terre Haute, Indiana

Trademark Reg. U.S. Pat. Off. U.S. Patents 2,282,078; 2,739,220; 2,739,221, and 2,231,506

Check 5789 opposite last page.

Batch rejections eliminated . . .



SiC batching and weighing system hikes production potential 300%

By **ROBERT MACLEOD,** Plant Manager
Carborundum Company, Keasbey, N.J.

Problem: Quality control was a recurrent headache at Carborundum Company's Keasbey, N.J., plant where batching and weighing of silicon carbide grain for manufacture of refractory bricks were handled manually.

A NEW SOLUTIONS FEATURE

Material was drawn from overhead bins into standard containers, hand-trucked to a knife-edge-type scale, weighed and then moved to storage.

SiC grain would work into pivots and bearings of the scales, throwing off calibration. Since exact proportions of five different sizes of grain (ranging from dust to No. 6 mesh) must be maintained in order to secure optimal refractory characteristics for any given application, some batches had to be rejected.

In addition, the scales required considerable maintenance, resulting in expensive downtime.

Solution: A pneumatically-controlled, fully-enclosed automatic batching and weighing system was installed.

Essentially, the system consists of 1) a bank of nine feed hoppers; 2) batch-in weigh hopper; and 3) associated controls. (See diagram on opposite page for details of system's components.)

The system offers options of A) automatic operation; B semi-automatic; and C) manual operation. Carborundum uses a combination of A and B.

With fully automatic operation, the process will repeat itself (once started) until stopped. Carborundum, however, needs a breather to remove storage containers. With semi-automatic operation, required weights are set in advance, and a button pushed for each ingredient.

At Carborundum, one button is pushed for the first ingredient; then the system completes the batch automatically. When the desired weight for the first ingredient is reached, that bin shuts off automatically; and the second starts emptying, this procedure being repeated until all ingredients have been added to the batch.

Panel lights signal which bin is emptying at the moment; weights are indicated on the net-weight-indication dial and are recorded on the circular chart recorder.

When the batch is complete, it is dumped into a 700-lb receptacle for transport to storage or use-points.

With manual operation, which Carborundum does not use, a button is depressed for each ingredient until the desired weight appears on the indicating scale. This option offers a post-facto method of changing the batch proportions or over-riding the operation.

Results: Production capability has been increased 300% without increasing the labor force. Batch rejections because of improper particle distribution have been eliminated.

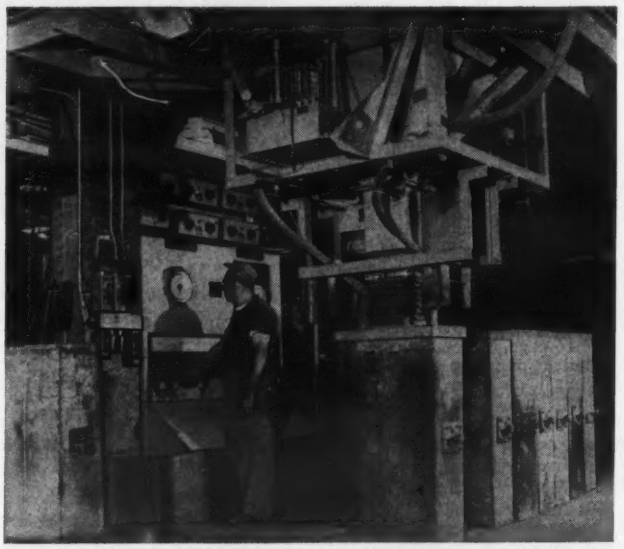
Maintenance problems usually encountered with knife edges, pivots, bearings, levers and other systems of mutually contacting parts are avoided with the flexure system of weighing.

Flexures are not affected by dust or corrosive fumes and, inasmuch as total operating movement is less than 0.005", they are not subject to friction effects or mechanical wear. Since the system was installed, downtime has been nil.

Adoption of a fully-enclosed system has obviated need for "fines" collection.

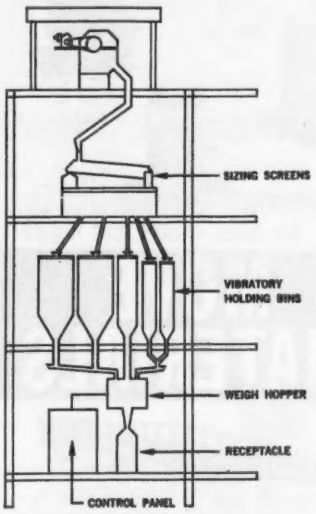
(Batching and weighing system, used by Carborundum, is manufactured by Weighing and Controls, Inc., Hatboro, Pennsylvania.)

Check 5790 opposite last page.



***Operator** at control panel selects desired weights for each of five or six different particle-sizes and starts batching and weighing sequence. Each particle-size is automatically dump-weighed into weigh hopper (above and to the right of operator). When batch is completed, it is discharged into receptacle underneath hopper*

Components of batching and weighing system



In Carborundum's automatic batching and weighing system, sizing screens feed five different sizes of SiC particles to nine holding bins, one each for smaller-size granules and two each for the larger. These are equipped with vibrators to prevent bridging at the hopper mouths.

The weigh hopper includes a hopper scale consisting of three unitized sections: an upper frame, a lower frame with vibratory discharge, and, in between, the weighing section which contains a 15-cu-ft weigh hopper and weight transmitter. Both hopper and transmitter are mounted in special flexural frames that assure weighing accuracy because the force on the load transducer is limited to a single vertical component.

The pneumatic weight transmitter (a force-balance-type instrument) consists of a flexure-mounted weigh platform and a load transducer. The signal is directly proportional to the net weight. Accuracy is ±0.25% of calibrated weight range and reproducibility better than one part in 2000.

The control panel is provided with weight selection verniers, net-weight indicator (dial), tare adjustment, hopper fill and discharge signalling, control mode selection (automatic, semi-automatic and manual) and a circular chart recorder.



LET YOUR CARRIER SPECIALIST FILL THIS GAP... EFFICIENTLY

FOR EXAMPLE, IS YOUR PROBLEM A MORE EFFICIENT METHOD OF MOVING *AND* COOLING HOT MATERIALS...MOVING *AND* DRYING MATERIALS? Your Carrier Vibrating Equipment Specialist has the specialized know-how that can fill the gap between problem and solution...between raw material and finished product...efficiently and economically.

Using the Carrier exclusive Natural Frequency Principle, vibrating equipment can be designed that will move hot materials, cool them en route, distribute or separate them...in one operation. Or others can be made that will elevate, dewater and dry *while* moving.

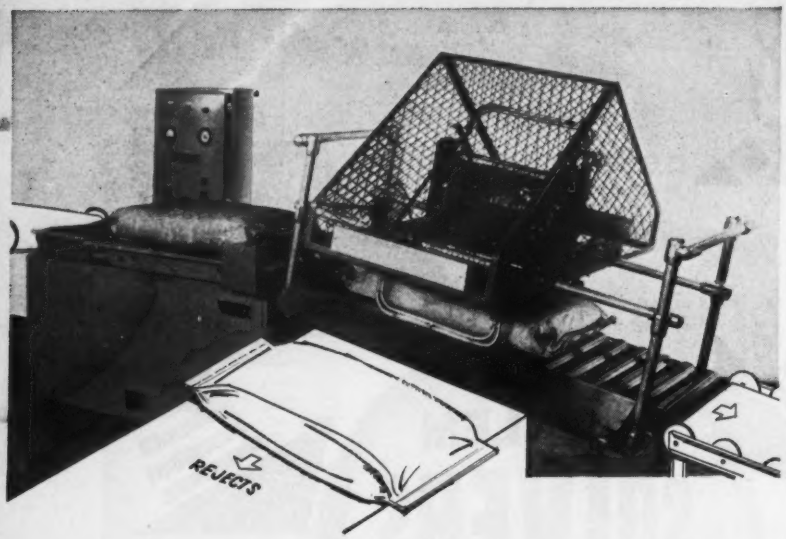
Why not have your Carrier Specialist study your operations with a view to reducing handling costs while increasing over-all efficiency. Remember, Carrier does more than just build equipment...we provide the specialized service that solves problems of moving and processing materials efficiently.

Call him or write Carrier Division of CHAIN Belt Company, 229 N. Jackson St., Louisville 2, Kentucky.

FOR ECONOMICAL MATERIALS MOVING
SEPARATING • FEEDING • DRYING • DEWATERING • COOLING
QUENCHING • COATING • DISTRIBUTING • ELEVATING

CARRIER
NATURAL FREQUENCY
VIBRATING EQUIPMENT

Check 5791 opposite last page.



SELECTROL® checkweighs bags with 1/10 of 1% accuracy

...with rate of speed at twenty 50-pound bags per minute...

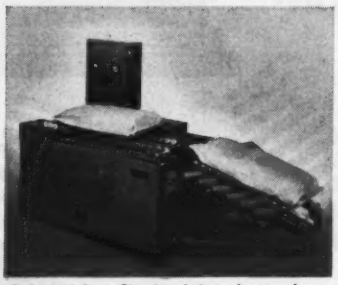
Model 1250 Selectrol, designed for installation in a production line, checkweighs bags from 25 to 150 pounds in motion... and detects weight variations as small as 1½ ounces or less per 100 pounds. Speed is variable—up to 25 bags per minute, depending on size and weight. Tolerance is adjustable to your requirements.

The Selectrol shown above has automatic overweight and underweight rejection mechanism. Models are available with underweight rejection only or without rejection mechanism. All electrical parts are fully protected against dust and oil.

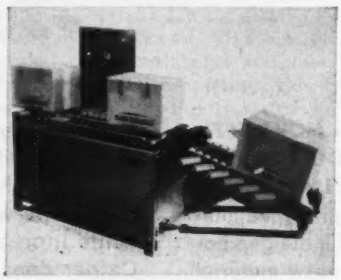
Optional equipment includes: recorders, counters, visual and audible signaling devices and special control accessories to your requirements.

Selectrols are made by Exact Weight, a leading manufacturer of job-engineered scales for 45 years with experience gained through hundreds of checkweighing installations.

WRITE FOR BULLETIN 3376



Selectrol Bag Checkweigher shown above without rejector mechanism



Selectrol Case and Carton Checkweigher with rejector mechanism. Acceptable weights continue in a straight line; over and under weight cartons are diverted off the line.

Exact Weight SCALES

THE EXACT WEIGHT SCALE CO.
905 W. FIFTH AVE., COLUMBUS 8, OHIO
In Canada: 5 Six Points Road, Toronto 18, Ont.

Find us in your local "Yellow Pages"

Sales and Service Coast to Coast

BETTER QUALITY CONTROL...BETTER COST CONTROL

Check 5792 opposite last page.

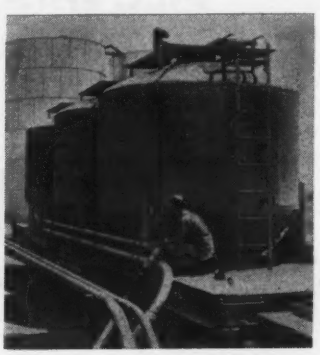
Pneumatic unloading setup built into tank-type car

Man can unload 70-ton car directly to bin in 30 min

Uses: Tank-type railcar designed for discharging bulk materials by air pressure directly into a plant, storage bin, or highway vehicle.

Features: Built-in pneumatic unloading system eliminates need for intermediate transfer system between car and storage bins. Patented aeration jet system makes tanks self-cleaning, reducing material waste and possibility of contamination. One man can unload car in 30 minutes directly to storage bin or silos.

Description: The 70-ton capacity car is permanently fitted with three tear-drop shaped tanks, each of 800 cu ft capacity, piped for pneumatic unloading. The load limit for the tank-type railroad car is 152,000 lb. Car frame can be extended to accommodate more tanks.

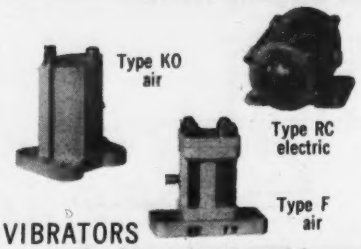


Pneumatic tank-type railway car is unloading fly ash at Ladue, Mo., plant of Western Flyash Company

Products varying in density from 16 to 168 lb/cu ft have been handled to date. System has conveyed some materials up to 40 cfm at distances of 1400′ with 100′ rise. Tanks are ASME coded at 40 psi.

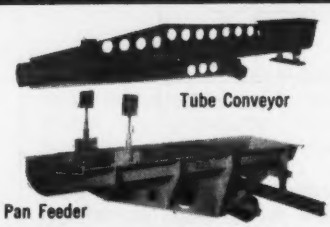
(AirJet tank-type railway car was developed by Halliburton Company and is being produced and marketed under a co-operative program by Pullman-Standard Division of Pullman Incorporated and Halliburton's Special Prod-

CLEVELAND VIBRATORS



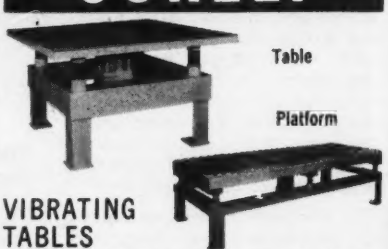
VIBRATORS for bins, chutes and hoppers

MOVE MATERIALS



VIBRATING CONVEYORS for granular materials

SAFELY... SURELY



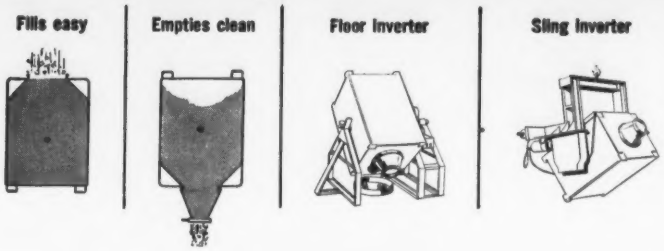
VIBRATING TABLES for packaging and concrete forms

Write today for complete information and prices.



2706-9 Clinton Ave., Cleveland 13, O.

Check 5793 opposite last page.

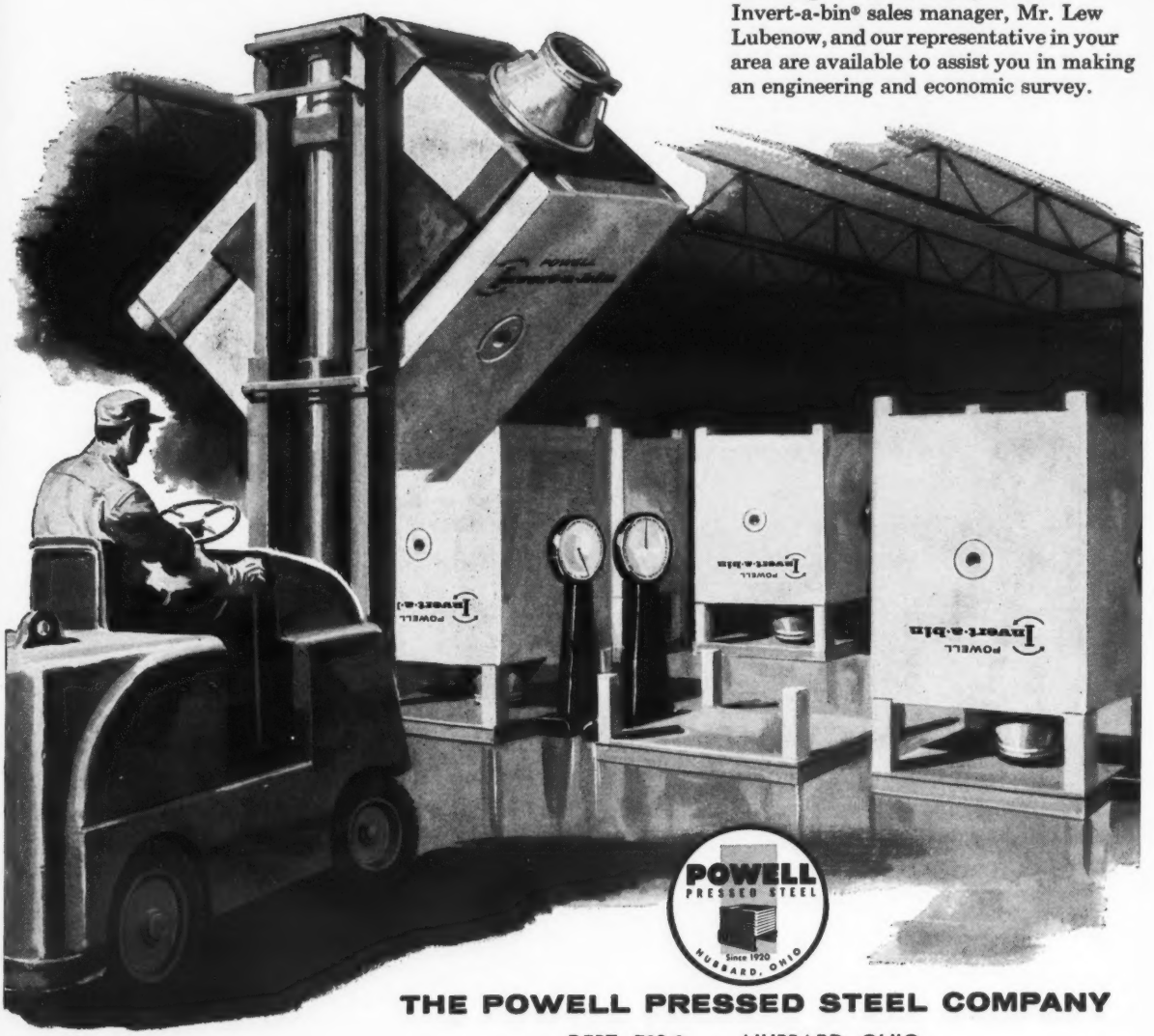


Powell's simplified Invert-a-bin® eliminates need for costly unloading equipment at every use-point

One grab and rotating attachment on standard lift truck, *one* sling type inverter with monorail or crane, or *one* floor type inverter and fork truck can service *any number* of use-points. No costly permanent unloading station required at each point of use.

Invert-a-bin® ideal for in-plant or inter-plant handling. Fills easily—empties clean. Can handle the most difficult materials in that it can be tumbled, aerated, and vibrated. Available in steel and aluminum.

Semi-bulk handling with the Invert-a-bin® replaces costly disposable packages, provides maximum flexibility with minimum capital investment and freight free advantages. Our Invert-a-bin® sales manager, Mr. Lew Lubenow, and our representative in your area are available to assist you in making an engineering and economic survey.

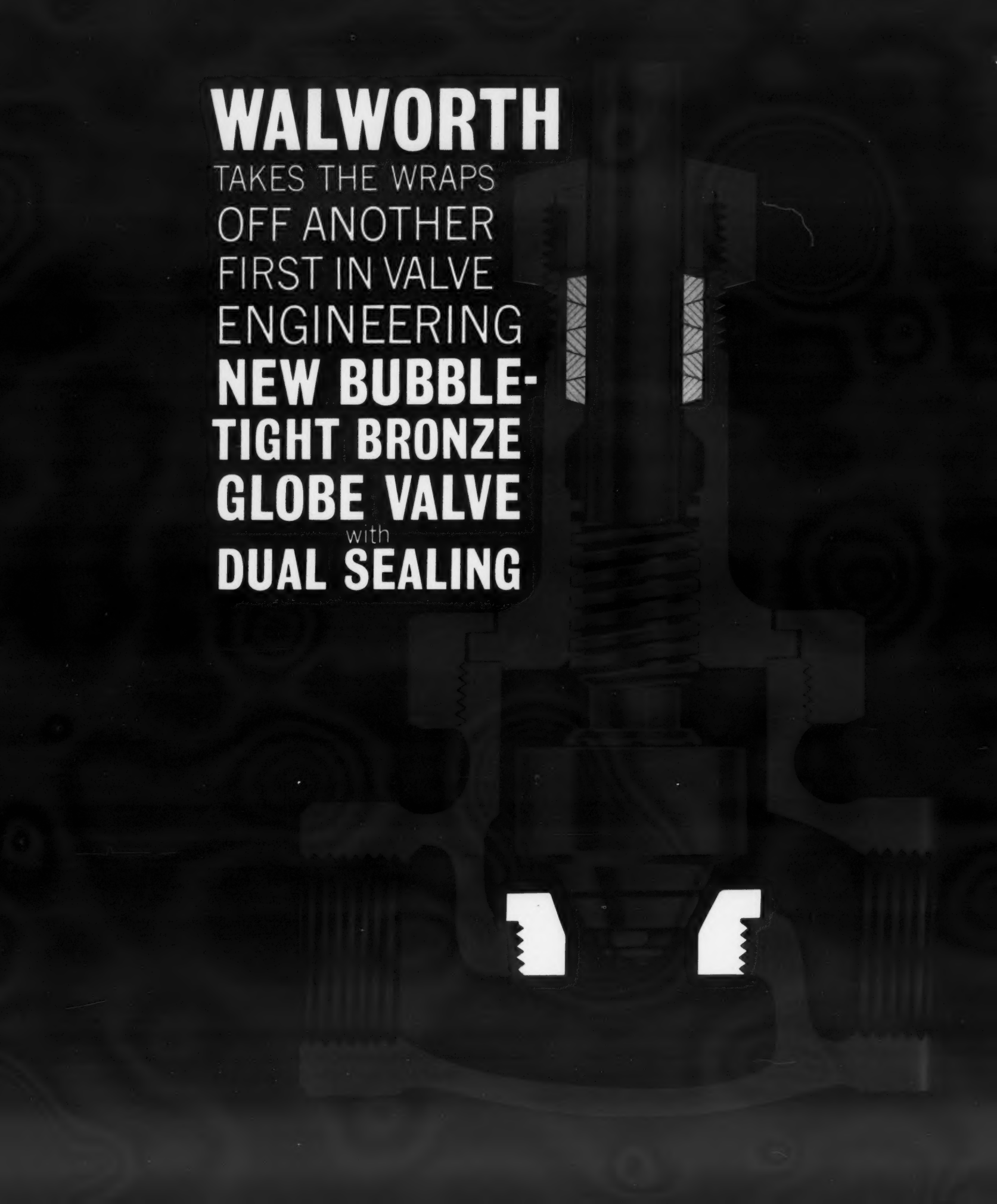


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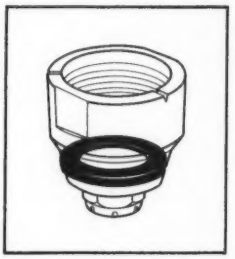
THE POWELL PRESSED STEEL COMPANY

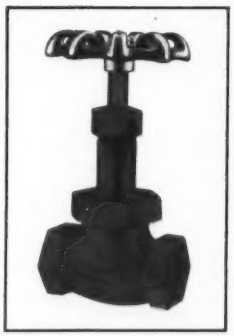
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Check 5794 opposite last page.


WALWORTH
TAKES THE WRAPS
OFF ANOTHER
FIRST IN VALVE
ENGINEERING
NEW BUBBLE-
TIGHT BRONZE
GLOBE VALVE
with
DUAL SEALING

ABSOLUTELY BUBBLE-TIGHT!





Here's the newest concept in valve design. Resilient unplasticized resin insert gives absolute shut-off in critical piping—at low torque. Now available for your particular requirements, the new Walworth Bubble-Tight Bronze Globe Valve is already in service aboard nuclear submarines, and in cryogenic gas piping systems—and is particularly suitable for the most critical water, oil and gas piping systems.

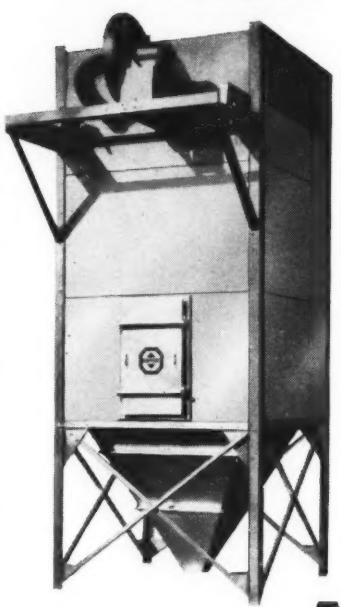
DUAL SEALING This unique unplasticized resin insert provides full 360° seal against matching monel seat. Secondary metal-to-metal seating further assures tightness... consistently. Write for descriptive bulletin.

WALWORTH

750 THIRD AVENUE, NEW YORK 17, NEW YORK

The Walworth Companies: Alloy Steel Products Company ■ Conoflow Corporation ■ Grove Valve and Regulator Company ■ M&H Valve and Fittings Company ■ Southwest Fabricating & Welding Co., Inc.

What should a filter filter?



The true test of a dust filter's efficiency is measured by the size of the particles it collects. Koppers new MODEL K AEROTURN *reverse-air jet* dust filter is virtually 100% efficient on sub-micron particles as small as 0.40μ. The dust filter that can cope with sub-micron particles will do a better job for you in these critical areas:

- *Good Community Relations.* The exceptional air cleaning efficiency of MODEL K AEROTURN meets strictest community codes . . . provides *maximum* employee protection, too.
- *Maximum "Product" Dust Recovery.* Retaining dust particles below one micron in size means *extra* product recovery for extra dollar savings, added operating profit.
- *Important Maintenance Savings.* Less labor, less time is needed for plant housekeeping with MODEL K AEROTURN on the job. Lower dust content in plant air means reduced machinery wear, longer life for working parts. Filtered air can be returned to plant for savings in heating and cooling.
- *Lower Air Filter Operating Costs.* Improved self-adjusting blow rings, proven pressure controlled filter cleaning reduce wear . . . increase filter tube life . . . cut operating costs. Rugged, simplified construction virtually eliminates maintenance and down time.

An efficient dust filter *must* meet your specific needs. Koppers engineers can do this for you. Write for a copy of our MODEL K AEROTURN brochure. KOPPERS COMPANY, INC., Dust Filter Dept., 4509 Scott St., Baltimore 3, Md.

KOPPERS

AEROTURN®

DUST FILTERS

Engineered Products Sold with Service

Check 6117 opposite last page.

Discharging granular materials into hopper.



~~CUT~~

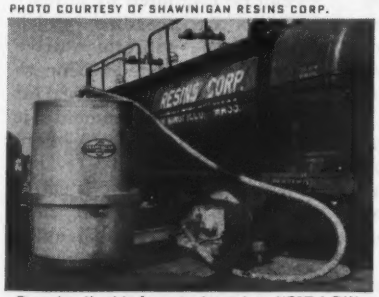
handling costs WITH NEST-A-BIN® bulk containers

KAISER NEST-A-BIN . . . for efficient shipping, handling and storage of liquid or granular materials . . . reduces labor costs, simplifies inventories. Bin designed for easy disassembly into two nestable half-sections for fast cleaning and inspection. Nesting also permits savings in space and shipping costs on return movement. NEST-A-BIN . . . in five sizes for liquids (220, 330, 440, 550 and 660 gal.), two sizes for granular (54 or 70 cu. ft.) in aluminum. For details, contact national distributors:

HOWARD TERMINAL CO., P.O. Box 857, Oakland 4, Calif.

KAISER INDUSTRIES

PHOTO COURTESY OF SHAWINIGAN RESINS CORP.



Pumping liquids from tank car into NEST-A-BIN, for direct delivery to consignee.

Check 5795 opposite last page.

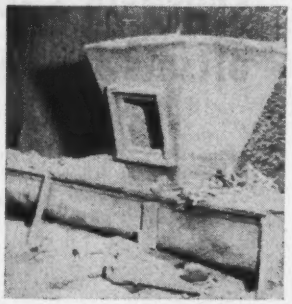
ucts Division, Duncan, Oklahoma.)

Check 5796 opposite last page.

(AirJet car is being produced and marketed under co-operative program by Special Division, Halliburton Company and Pullman-Standard Division of Pullman Incorporated, 200 S. Michigan Ave., Chicago 4, Ill.)

Check 5797 opposite last page.

▶ A NEW SOLUTIONS ARTICLE



Low-cost housing . . .

. . . is provided, in effect, for this closed screw conveyor by the rubber-covered trough shown above. Before this housing was installed, maintenance on the conveyor was costing $400 every eight months for downtime, labor and parts. Pulverized, hot fertilizer would cake and pack solidly causing the screw to twist and break.

By substituting a housing of rubber-faced steel plate, the resilience of the rubber facing prevents accumulation of dust. Vibration of the screw causes the rubber to give, crumbling any accumulated fertilizer. Maintenance has been nil in three years since trough was installed.

(Rubber-faced steel plate for conveyor housing was made by Gates Rubber Co., 999 S. Broadway, Denver 17, Colo.)

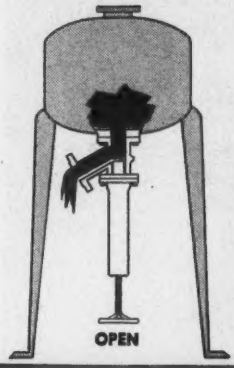
Check 5798 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Strahman RAM TYPE DRAIN VALVES

FLUSH BOTTOM VALVE THAT WILL NOT CLOG

Designed for Chemical and Pharmaceutical industries





The Strahman Drain Valve is the only valve that cannot clog up. It is so designed that in the closed position the piston or ram extends up into the tank thus preventing any possibility of the outlet becoming plugged.

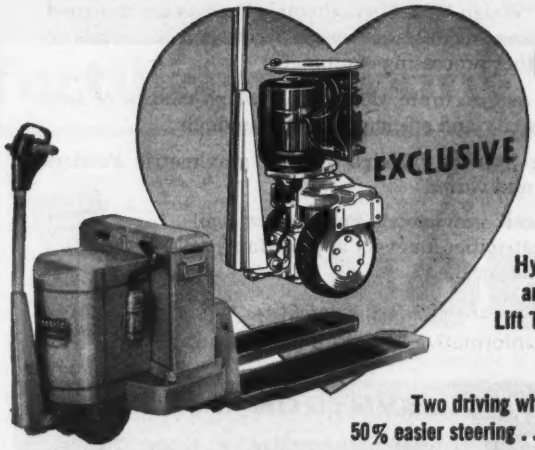
In the open position, full and unobstructed flow is assured as the piston is drawn down into the bonnet leaving a completely open passage for the material passing through.

Write direct for complete catalogue

STRAHMAN VALVES INC. NICOLET AVENUE FLORHAM PARK, N.

Check 5800 opposite last page.

HEART OF THE HydroLectric . . . THE DYNA-DUAL POWER UNIT



Compare the Hydrolectric features with any other "Driver Lead" Lift Truck. The Hydrolectric quality of construction merits your inquiry.

Two driving wheels instead of one . . . 50% easier steering . . . ease of maintenance.

NOTE: The Dyna-Dual Power Unit is interchangeable on all models.

A TRUCK FOR EVERY PURPOSE AND MATERIAL



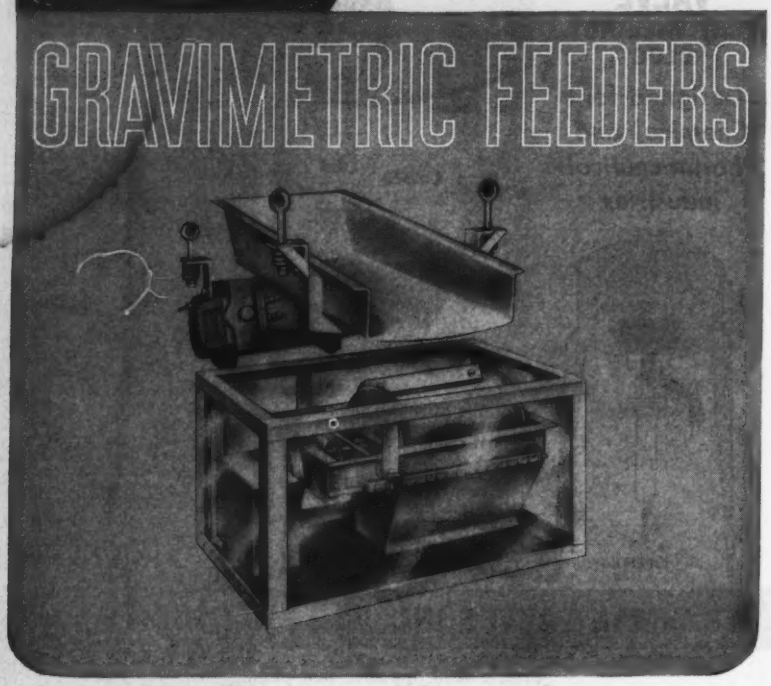
LIFT TRUCKS, INC.
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Check 5801 opposite last page.

for accurate, continuous feeding of bulk materials

SYNTRON WEIGH WHEEL

GRAVIMETRIC FEEDERS



increase the capacity and efficiency of your operation

A new idea in weigh feeding bulk materials has been developed by Syntron. The unique "Weigh Wheel" gravimetric Feeders are designed for accurate, continuous, dependable weigh feeding of materials to mixers, dryers, and other processing equipment.

Their simple design and accurate, dependable weigh control of feed flow increase the capacity and efficiency of end products.

The applications for Syntron "Weigh Wheel" gravimetric Feeders in industry are wide and varied.

Syntron "Weigh Wheel" gravimetric Feeders are available with maximum capacities for every application from 500 pounds to 300 tons per hour.



Let Syntron solve your weigh feeding problems.

Write for free informative literature today.

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Other Syntron equipment of proven dependable quality



Hopper Level Switches



Spiral Elevators



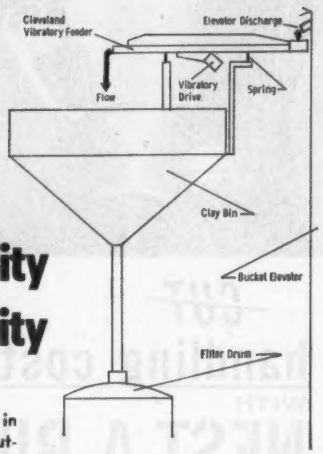
Flow Control Valves

Check 5802 opposite last page.

MATERIAL HANDLING and PACKAGING



Where failure would mean expensive downtime . . .



Conveyor's reliability offsets inaccessibility

Air-powered vibrating feeder, shown in photo, provides failure-free service in out-of-way location while feeding hot clay to batch hopper

Problem: Finding a failure-free method of carrying hot (200°F) bauxite clay from furnace to receiving hopper was a "must" before hopper capacity could be increased in the lubricating department of Sohio Refinery No. 2 at Cleveland, Ohio.

A NEW SOLUTIONS FEATURE

The clay, used as a filter for industrial lubricants, is regenerated for re-use by a washing-and-burning process.

A bucket elevator carried it from the furnace to a chute where it was gravity-fed to the hopper. Raising the sides of the hopper to increase its capacity decreased the angle at which the chute could be mounted so that the slope was not acute enough for the clay to flow freely from the elevator discharge into the hopper.

Reliability of any conveying system chosen for this job would be a primary consideration. The system would be located high above the floor, relatively inaccessible.

Any breakdown would mean loss of valuable time while maintenance men climbed up to investigate the trouble. If extensive repairs were needed, production would have to be halted. The location precludes the possibility of improvising a temporary system to keep the clay moving while repairs are being made.

Solution: After considering several possibilities, Sohio officials chose an air-powered vibrating conveyor to feed the clay in a steady, controlled stream.

Hot bauxite falls from the furnace bucket elevator into the conveyor and is carried 10′ horizontally by the vibrating tube at a rate of ¾ ton/hr, approximately one-third of the conveyor's capacity. Rate of flow — set to match the output of the bucket elevator — can be regulated by adjusting the air pressure, which operates the vibratory drive mechanism located beneath the conveyor. A valve for making this adjustment is mounted at a convenient height on the wall.

When the conveyor is set in motion, an oil reservoir, next to the air pressure valve, automatically feeds a fine stream of oil into the air stream to lubricate the conveyor's single moving part, a piston.

This drive mechanism is dust-proof, forestalling the

possibility of jamming by dust dispersed by the clay as it falls into the conveyor.

The conveyor, fabricated of carbon steel, is mounted on four springs which serve only to isolate the vibration from surrounding structures.

Results: Operating for periods of 12 to 18 hours a day, three days a week, the conveyor has not required any maintenance in more than a year. Two men installed the equipment in one working day — between preparation of batches — so that production was not interrupted.

The only part of the conveyor that could fail — the vibratory mechanism which has the one moving part, the air piston — can be replaced in less than 30 minutes.

(Vibrating conveyor is manufactured by The Cleveland Vibrator Company, 2828 Clinton Ave., Cleveland 13, Ohio.)

Check 5803 opposite last page.

Design precedents broken to build giant railcar

Unitized construction used

Uses: Hauling liquefied petroleum gas and anhydrous ammonia between manufacturing plants and storage points.

Features: Giant tank car, largest which can be built on four-wheel trucks, has water capacity of 30,300 gal. Standard underframe is eliminated. Tank and truck mountings are a unit, following "unitized construction" principle used in automobiles.

Description: Car is 68′ (19′ shorter than other large-sized tank cars) and is level across top except for conventional pressure dome.

Measuring 99″ in diameter, it swells to 118″ at the midriff. Trucks are high-speed, roller-bearing type capable of travel at 85 mph.

(Giant tank car is development of General American Transportation Corporation, 135 S. LaSalle St., Chicago 3, Illinois.)

Check 5804 opposite last page.

this PAYLOADER® operator runs



one-man fertilizer-mixing plant

Consumers Cooperative Association, Kansas City, Mo., operates a dozen bulk fertilizer plants in a nine-state area. Each plant mixes fertilizer—from a ton to a truckload—to the customer's specifications while he waits. The entire process is operated by one man from the seat of a "PAYLOADER" tractor-shovel.

This fast, accurate and efficient cycle begins with the "PAYLOADER" and its precise, hydraulic bucket control with which the operator takes the separate ingredients from their bins and weighs each one into a 1-ton scale hopper. By means of air-control valves and push-buttons grouped within his reach, he dumps the hopper, elevates the batch to the mixer, starts the mixer and dumps the fertilizer through a chute into the waiting truck.

As soon as the scale hopper is emptied, he loads it with another batch so that the process is practically continuous, and up to 20 tons of fertilizer can be mixed and delivered per hour.

Your Hough Distributor has a "PAYLOADER" size — up to 12,000 lbs. operating capacity — to fit your job, plus the finest service and parts facilities in the business.

HOUGH®

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY - INTERNATIONAL HARVESTER COMPANY

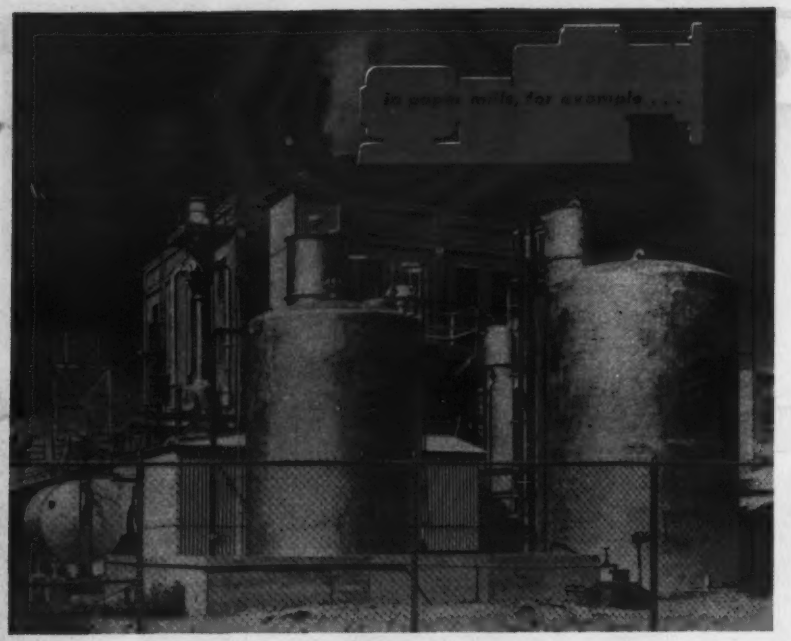
THE FRANK G. HOUGH CO.
744 Sunnyside Avenue, Libertyville, Ill.

☐ Send data on HA "PAYLOADER"
☐ Send data on larger "PAYLOADER" units

Name
Title
Company
Street
City State

9-A-1

Check 5805 opposite last page.



Pulsafeeder compounds chlorine dioxide bleach in perfect proportion without leakage

For Nekoosa-Edwards Paper Company, a special quintuplex Pulsafeeder provides continuous production of a bleaching compound that is too unstable to store. Each of the five heads is independently adjustable to meter out the proper proportion of water, sodium chlorate, sulphuric acid, and two additions of methanol. Result: a critically precise formulation of chlorine dioxide, with total output controlled by a single variable speed drive to keep pace with process rate. Never a drop of leakage . . . never a trace of corrosion . . . in over four years of steady use!

PULSAFEEDER IS THE METERING PUMP THAT:

withstands the hardest-to-handle materials you can feed into it . . .

meters them at critically controlled flow rates . . .

never leaks a drop . . .

and completely seals pumping fluids from process materials so there can never be a trace of contamination.

The harder your materials are to handle, and the tighter your tolerances, the more you need a Pulsafeeder. Choose from today's most complete line—in flow rates from a few drops to 15.7 gallons per minute—with reagent heads resistant to any material you use.

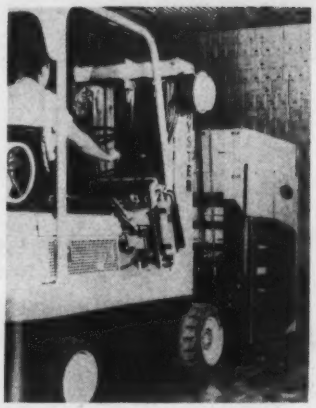
WRITE for Catalog 59. Lapp Insulator Co., Inc. Process Equipment Division, 1321 Poplar Street, LeRoy, New York.



Lapp

Check 5806 opposite last page.

LATEST INDUSTRIAL TRUCK DEVELOPMENTS

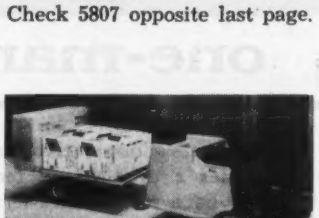


Up to 15% space savings

. . . for storage is possible through use of lift truck and palletless handling attachments such as device shown above. Aluminum arms of attachment are 1¾" thick, permitting tighter stacking of loads. Clean, smooth lines of arms offer no sharp corners or protrusions to dig into, or dislodge adjacent stacks.

(Cart-N-Grab attachment is manufactured by Hyster Company, PO Box 4318, Portland 8, Oregon.)

Check 5807 opposite last page.



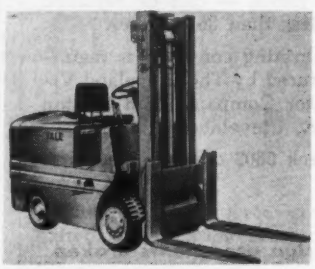
Compact electric car

. . . is designed for use by executives, supervisors, maintenance men, process engineers and others with similar job requirements. Equipped with 250-lb capacity trailer, three-wheeler can be used also for small hauling jobs throughout the factory.

Driven by 12-v electric motor, operated by foot switch, it is powered by 12-v lead-acid battery equipped with trickle charger. Car can be operated for full shift, then recharged by plugging trickle charger into 110-v circuit. Recharging is accomplished in 12 hr. Forward speed is factory-set at 5 mph.

(Three-wheel Delwick electric car is being introduced by Namisco, Incorporated, 535 Morris Avenue, Springfield, New Jersey.)

Check 5808 opposite last page.



Dust protection built-in

. . . to lengthen life and cut maintenance costs for gas-powered lift trucks operating under conditions of severe atmospheric contamination. Among safeguards provided by modification are triple filtering process in place of standard dual air filter arrangement, sealing of hydraulic sysem, and fitting of forced crank case ventilating system with sealed filter cap and breather line off air filter.

(Heavy-duty dust protection modification is available on KG51 gas-powered lifttrucks, manufactured by Yale Materials Handling Division, The Yale & Towne Manufacturing Co.)

Check 5809 opposite last page.

Special electric truck's role in diverse operations, jobs best suited for them, economics of using "specials," and check list to aid potential users, are included in Elpar Case Book — The Elwell-Parker Electric Company.

Check 5810 opposite last page.

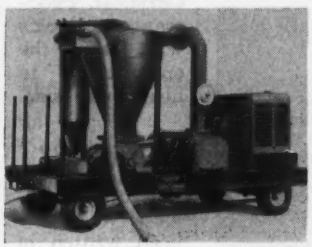
Portable transfer unit propels dense stream through small ducts

Uses: Pneumatic transfer of whole grains, seeds, beans and similar granular materials.

Features: High-efficiency positive-pressure, constant-displacement blower of portable transfer unit propels dense stream of material through relatively small ducts.

Description: Unit delivers maximum capacity for given pipe area, permitting use of minimum dimension nozzles, hoses and ducts, providing minimum weight and increased portability.

Vacuum side picks up material and pressure side delivers



Maximum capacity, minimum size distinguish portable transfer unit

it to destination. Incoming material is separated from conveying air by a cyclonic receiver on the vacuum side of the blower and reintroduced through airlock into conveying air on the pressure side. Second-stage separator prevents carry-over of material.

Pre-assembled unit is equipped with rubber-tired wheel sets with steerable front axle, draw bar and parking brake. Unit is available for 3″, 4″ and 6″ diam pipe sizes.

(Portable Airveyor transfer unit is a development of Fuller Company, Catasauqua, Pa.)

Check 5811 opposite last page.

Non-sticking characteristics imparted by silicone coatings to variety of package liners, processing papers, interweaving and slip sheets are described in brochure. Also included are samples of coated paper. Bul 8-605 — Dow Corning Corporation.

Check 5812 opposite last page.

GENERAL AMERICAN AIRSLIDE® CARS

Here's measurable endorsement of General American Airslide Cars for shipping dry powdered or granular materials. Bulk shipments are safe from contamination. Unloading by any means of conveying is easy and economical—particularly for those materials which tend to bridge or pack in transit. If you ship flour, sugar, starch or similar materials—it will be well worth your while to find out how your costs can be cut and performance improved with Airslide cars.

MORE THAN 5000 IN SERVICE!

Airslide® and Dry-Flo® Car Division
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South LaSalle Street • Chicago 3, Illinois
Offices in principal cities

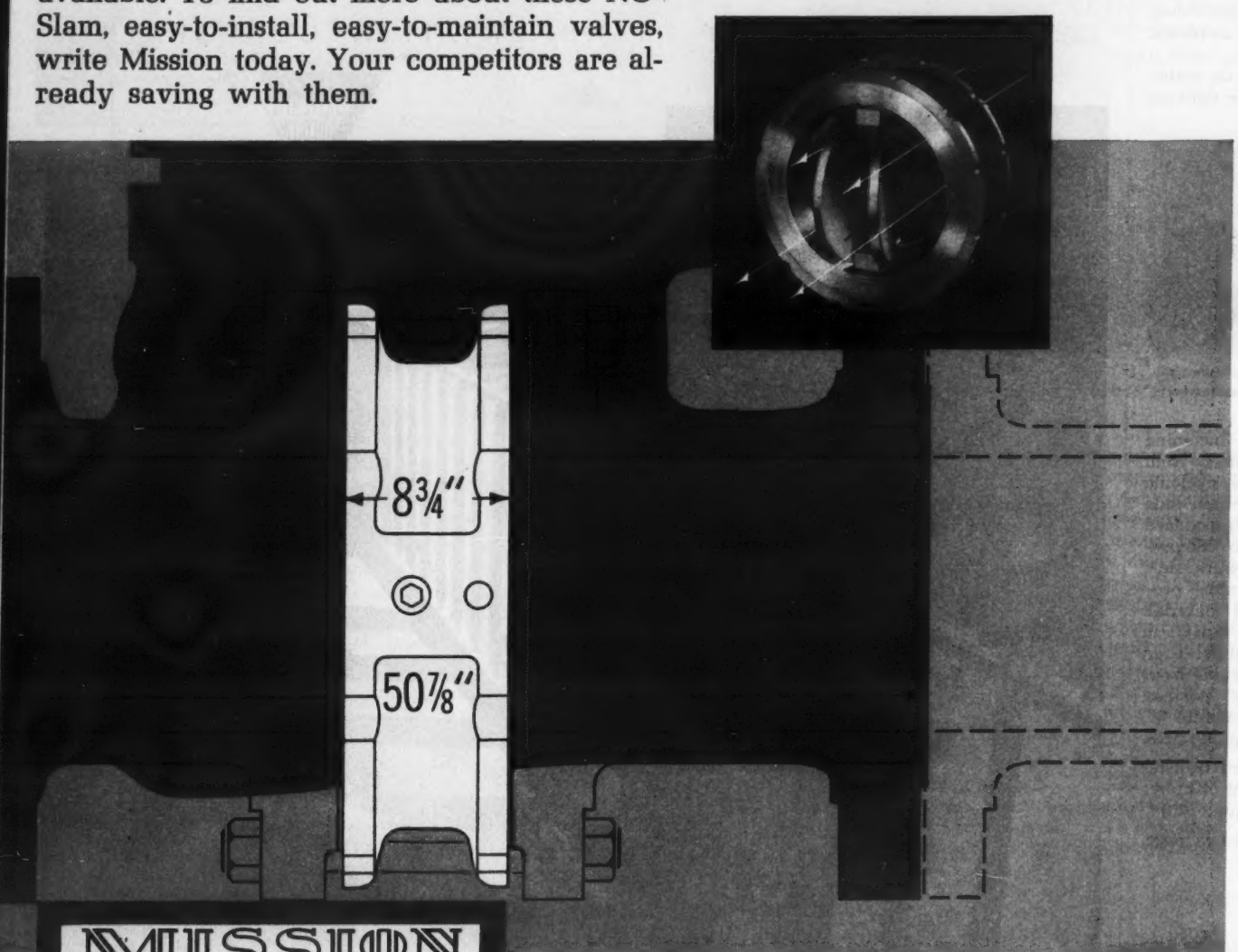


Check 5813 opposite last page.

The illustration compares a 10-inch Duo-Chek Check Valve with a conventional check valve. In one application a 10-inch, Series 2500, Duo-Chek, which meets all ASA strength and design requirements except face-to-face size, is in continuous operation on a reciprocating compressor discharge line. A conventional swing check in this service would weigh over 5,000 pounds. The Duo-Chek weighs 285 pounds.

Here are some more quick facts: Available in sizes from 2 to 48 inches, ASA series 125 through 2500, in steel, stainless, aluminum, and bronze. Corrosion and heat resistant seals available. To find out more about these NO-Slam, easy-to-install, easy-to-maintain valves, write Mission today. Your competitors are already saving with them.

Mission Duo-Chek weighs less than 10% as much



MISSION VALVE AND PUMP CO.

MISSION VALVE AND PUMP CO. A SUBSIDIARY OF MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas • Cable Address "MISSCO" Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • Cable Address "MISSOMAN" • Sold by Mission Manufacturing Company outside of Canada and the U.S.A.

Check 5814 opposite last page.

WHAT DO YOU THINK?

Opinions and comments on the significant subjects carried in each month's CHEMICAL PROCESSING are important! We *welcome* your letters expressing your views.

Many CP readers are taking the opportunity to state their views on today's top questions.

By publishing your letters in CHEMICAL PROCESSING, others will have the opportunity to hear your side.

Perhaps you agree

with what has been written in these articles.

Maybe you don't.

You might even have a thought or angle which wasn't expressed.

If so, why not let us and others hear your ideas? Suitable letters will be published in our regular "Letters from Readers" column. (See page 17.)

Address your comments to:

The Editor

CHEMICAL PROCESSING

111 E. Delaware Place, Chicago 11, Illinois.

NEW LITERATURE

Material Handling and Packaging

Two packaging films, recently introduced, are subject of four-page bulletin. Films combine two light-gage cellulose sheets with thin polymer-resin inner ply. T-69 has nitrocellulose coating on both surfaces while T-79 is polymer-coated on both sides. Avisco T-films Bul — Film Division, American Viscose Corporation.

Check 5815 opposite last page.

Aluminum bottles, available in 28 assorted stock sizes and shapes for packaging, shipping and storing of chemicals, minerals and foods, are described in four-page brochure. Specifications for seamless containers include heavy gage 1100 (2S) aluminum (minimum 99%). Finish is of commercial caustic etch. Brochure contains list of chemicals suitable for these bottles. Bul AA45 — American Aluminum Company.

Check 5816 opposite last page.

Flexible packaging machinery, which will automatically form and fill from 60 to 400 pouches/min, is subject of eight-page illustrated brochure. Also given are specifications, principle of operation and uses of machinery with integrated cartoning machines. Packaging-Cartoning Bul — Bartelt Engineering Company, Inc.

Check 5817 opposite last page.

Belt-propelled tripper and dual roll idlers are described and specifications presented in Tripper-Idler Bul — Finco Inc.

Check 5818 opposite last page.

Pneumatic systems, for handling plastic cubes, prills, dice, pellets and chips, with capacities ranging from 3000 to 20,000 lb/hr are described in Bul PC/101—Young Machinery Company.

Check 5819 opposite last page.

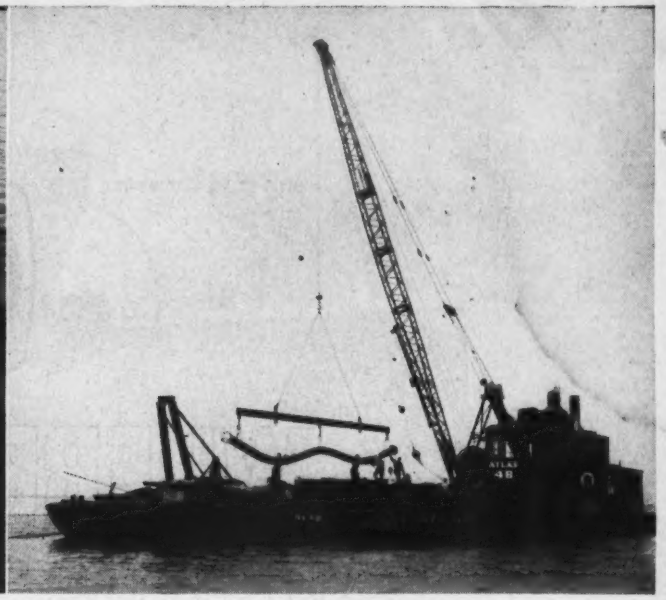
Material handling functions performed by automated material control systems (identify, dispatch, store, recall and deliver) are cited in eight-page brochure. Booklet is oriented to those concerned with cost reduction in handling of materials. Bul GEA-7130 — General Electric.

Check 5820 opposite last page.

Potential savings in production time and space requirements through use of two models of vertical lift bucket elevators are cited in Bucket Elevator Bul — Kari-All Division, Springfield Welding Co., Inc.

Check 5821 opposite last page.



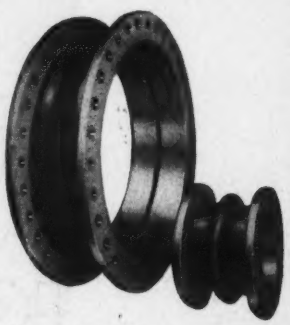


CONDOR RUBBER PIPE used for Largest Under-Water Waste Disposal System

A large chemical plant has installed 1864 feet of 12″ diameter Condor Flexible Rubber Pipe in the lower Delaware River to discharge process wastes from shore to the river channel. Condor Rubber Pipe provided flexibility to permit bolting 50′ lengths together on the deck of the dredge and laying them into a trench in the river bottom. This was easier than bolting or welding a metal pipe-line under water . . . and the rubber pipe will last longer than metal against salt water corrosion outside; nitric and sulfuric acid wastes inside.

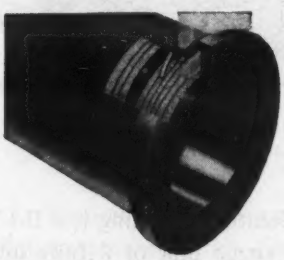
Condor Flexible Rubber Pipe outlasts steel 3 to 10 times. It is made in types to withstand pressures up to 250 psi. Installation is easy, economical—and there's no danger of leaky joints at pipe bends. New Hydro-Lok built-on flanges offer full sealing surface *plus* advantage of sure alignment and easy rotation of pipe to equalize wear—*without* removing flange bolts.

Let an R/M representative give you details on Condor Flexible Rubber Pipe . . . or write today for Bulletin 7152.

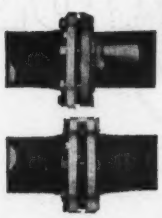


R/M RUBBER EXPANSION JOINTS

- Overcome Pipe Expansion Stress
- Avoid Piping Misalignment
- Resist Abrasion and Corrosion
- Offer Maximum Resistance to Shock
- Require No Gaskets



- Steel Pressure Ring molded into Hydro-Lok Flange
- Thick, corrosive resistant tube
- Multiple plies of heavy duck
- Reinforcing spiral of steel spring wire
- Tough durable cover



Hydro-Lok Flanges may be used with equal ease to couple rubber pipe to iron pipe with standard flanges (top) or existing sections of rubber pipe using other flanges.

RM 1008

RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY

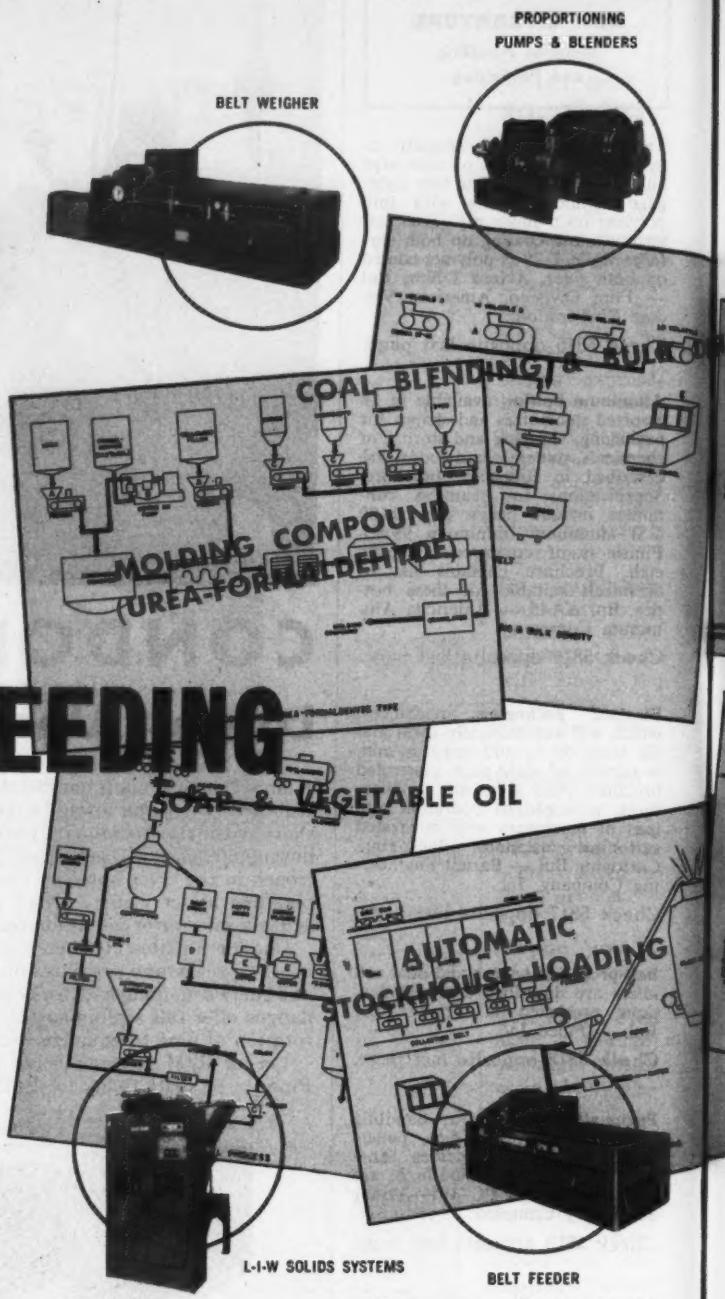
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ENGINEERED RUBBER PRODUCTS ... MORE USE PER DOLLAR

Check 5822 opposite last page.

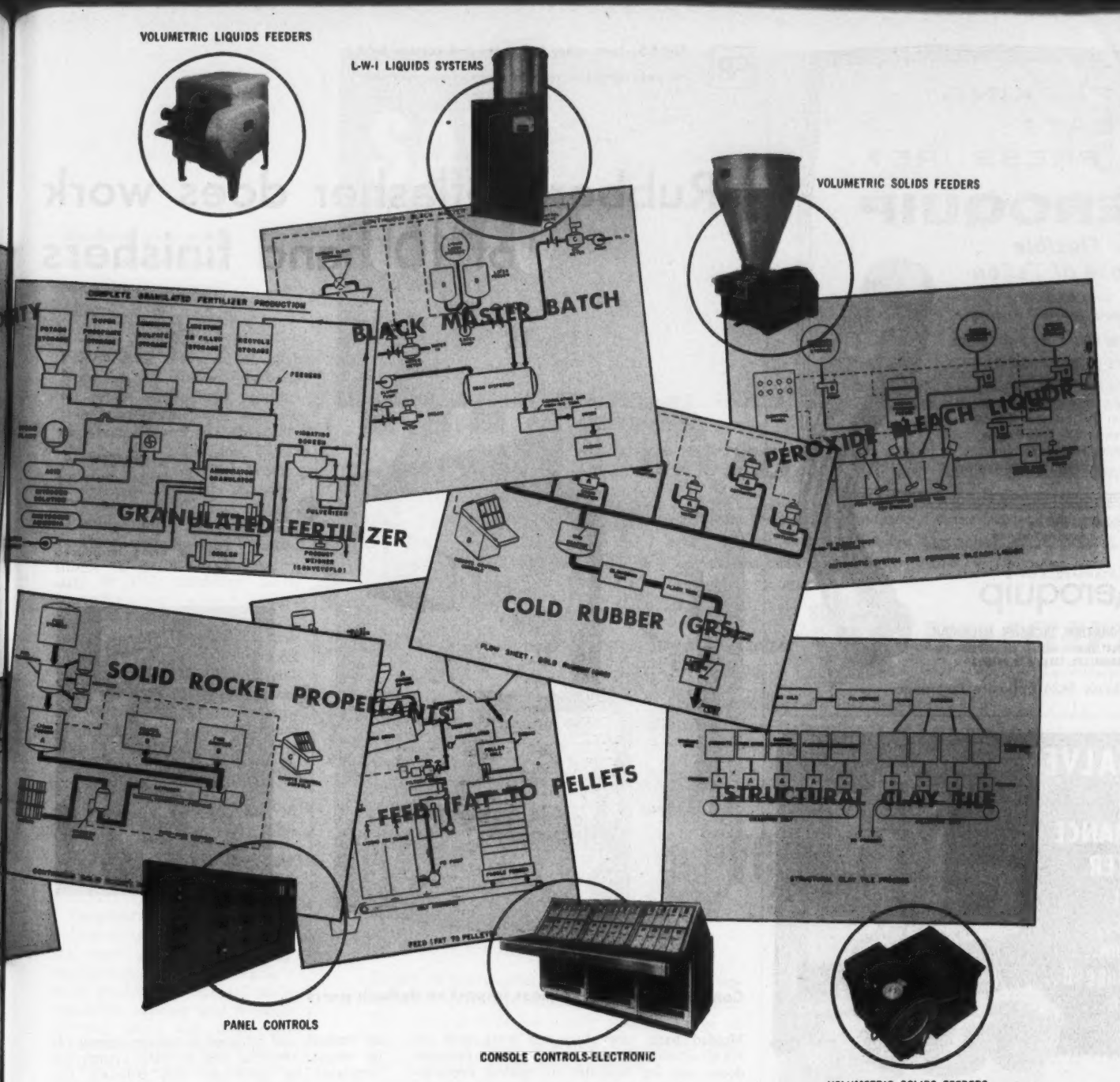
B-I-F

WHEREVER AUTOMATIC, CONTROLLED FEEDING OF LIQUIDS AND SOLIDS IS INVOLVED



Controlled feeding is a B-I-F specialty . . . whether it involves a single unit or a fully integrated system with provision for remote control. Thousands of installations throughout the chemical processing industries prove B-I-F's ability to handle chemicals of all kinds . . . including corrosive, toxic or hazardous types.

B-I-F has over 30 years of actual field experience in controlled feeding systems for solids and liquids. And . . . B-I-F manufactures the most complete line of volumetric and gravimetric feeders. The resulting application flexibility can give you a performance-proved system . . . based on your most exacting needs.



Reliability . . . precision control . . . accuracy . . . these are the keys to profitable batch or continuous processing. No one type of feeder or feeding system can meet every processing requirement. B-I-F's application knowledge assures the exact equipment for end product quality . . . minimum production cost . . . minimum waste!

B-I-F **Industries**

A DIVISION OF THE NEW YORK AIR BRAKE COMPANY

METERS • FEEDERS • CONTROLS / CONTINUOUS PROCESS ENGINEERING



YOU NAME IT! When it comes to controlled feeding of liquids and solids, a B-I-F specialist is ready to recommend and furnish estimates. See Chemical Engineering Catalog or Sweet's Plant Engineering File for your nearest B-I-F representative . . . or write **B-I-F Industries, 387 Harris Avenue, Providence 1, R. I.**

For more information on product at left, specify 5823 see information request blank opposite last page.

FLEXING?
HEAT?
PRESSURE?

AEROQUIP

Flexible
Hose of Teflon
and Reusable
*"super gem" Fittings**

Whatever your steam problem here's your answer!

When you find heat, pressure or flexing cuts life of ordinary hose, get our bulletin IEB-50— or look in "Yellow Pages" under "Hose" for your Aeroquip Distributor.



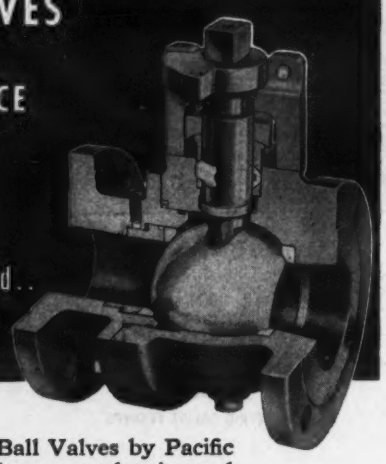
*U.S. Patent Nos. 2,833,307 and 2,781,279
**"super gem" is an Aeroquip Trademark
Teflon is DuPont's trade name for its tetrafluoroethylene resin

STANDARDIZE ON Aeroquip

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Check 5824 opposite last page.

BALL VALVES
PACIFIC'S
PERFORMANCE
PACESETTER
Bubble-tight
Shut-offs...
Two-way Flow...
Compact, Rugged..
Quarter-turn...
Fast-acting



NOW! A
complete line of Ball Valves by Pacific Valves for general purpose, abrasive and corrosive service...from vacuum to 1000 psi....solid Teflon stem packing with simple take-up adjustments ...adjustable compression on ball-seals...standard body materials include cast iron, ductile iron, carbon steel, type CF8, CF8M, Alloy 20 and Monel. Seal matl.: Viton, Buna-N, Neoprene, Kel-F, Teflon and Nylon. 150 lb. Flgd. Ends: ½" to 14"; Scrd. ¼" to 2". Send for Pacific's Ball Valve Cat. BV-60.

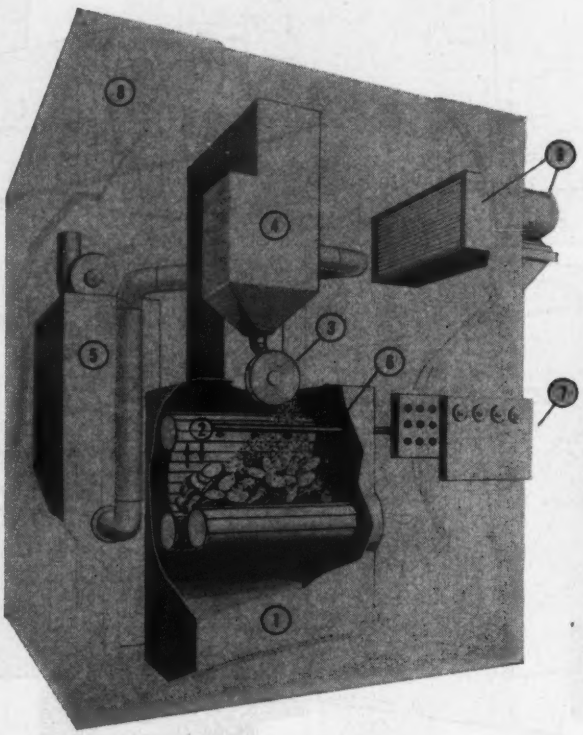


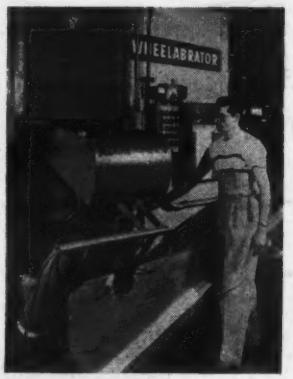
PACIFIC VALVES, INC.
32nd and Walnut, Long Beach 7, Calif.

Check 5825 opposite last page.

cp **IDEAS: from other industries and nuclear field — new trends in research, processes, services**

Rubber deflasher does work of 10 hand finishers





Lead is being introduced into deflasher at Acadia plant

Combines freezing, airless impact to deflash parts

Molded parts enter two-cu-ft work area (1) via air-operated loader through two air-operated doors and are deposited on endless steel-slat-type conveyor (2) moving at low speed. Cascading action of conveyor exposes each part to CO_2 and impact media during cycle. Deflashed parts are unloaded by reversing conveyor.

Liquid CO_2 (flow regulated by solenoid and actuated by adjustable timer calibrated in seconds) enters manifold under 250-300 psi, passes through four nozzles (6), vaporizes and freezes flash. Media-hurling device (3) is then actuated for pre-timed cycle. Media, spherical steel pellets (0.007 to 0.017" in diam), are hurled from eight-bladed heel against molded parts exposed by tumbling action of conveyor. Wheel will hurl 20 million particles a second.

Media particles drop through conveyor slats and are picked up by belt-and-bucket elevator, air washed, and returned to storage hopper (4) for re-use. Machine and air-wash system are ventilated by cloth-type dust collector (5), equipped with shaker system to clean bags. Enclosure (8) housing deflasher and dust collector is kept at temp of 0° to −10°F by auxiliary refrigeration system (9), provided with automatic defrosting unit. Operation can be controlled manually or automatically from control panel (7).

Process is limited to removing flash 0.005" or less and is not, at present, recommended for low-durometer, high-tensile-strength compounds, certain silicones and "loaded" compounds, such as those high in graphite, etc.

It is possible to process 10 loads/hr at 80% efficiency. Gas consumption ranges from three to 15 lb/load, while media costs average less than cent per load.

Machine overcomes age-old bottleneck for rubber molder

PROBLEM: Removal of flash from molded rubber products has been an age-old production bottleneck. Take the case of Acadia Synthetic Products Division, Western Felt Works.

A NEW SOLUTIONS FEATURE

At Acadia's Chicago plant, O-rings and other molded products were finished by hand — trimming, buffing, tearing — and by CO_2 tumbling. Both operations were time-consuming and costly.

Tumbling (in which parts are frozen and flash removed by impact of parts being tumbled against each other) was considered inadequate for finishing precision parts. Drawbacks included breakage, cost of gas (usually Co_2) and need to retumble.

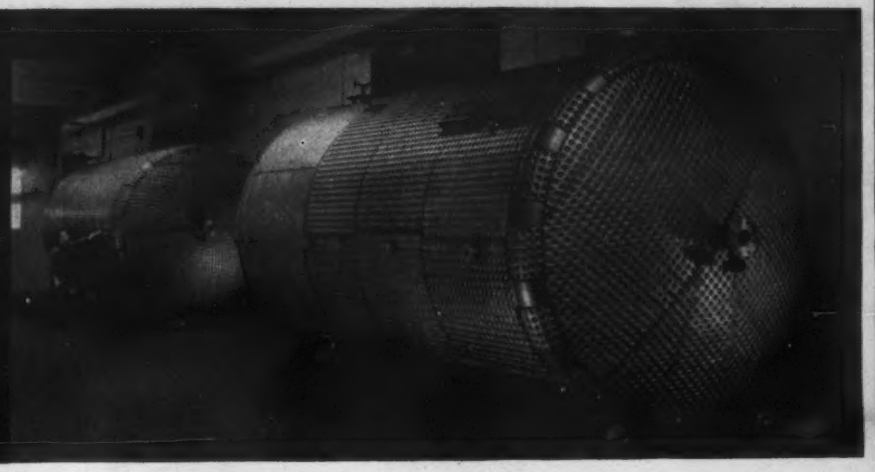
Solution: When a mechanical rubber deflasher, utilizing the principle of airless impact, was introduced in the summer of 1960, Acadia was the second company to apply the unit.

Installed last August, the deflasher is currently operating one shift/day, finishing approximately 60% of Acadia's total production. Special seals requiring skiving and molded silicone parts are exempted from mechanical deflashing.

Consisting basically of a deflashing machine and a dust collector (to ventilate the operation and remove impurities from the media supply), both units are housed within a fully insulated enclosure equipped with an auxiliary refrigeration unit.

Molded rubber parts (flash does not exceed 0.005″) are introduced by air-operated loader into two-cu-ft work chamber where liquid CO_2 is sprayed in such a manner as to freeze flash but not the parts. Spherical steel pellets are hurled by centrifugal force

SAVE UP TO 25% with BRIGHTON dimple jackets ASME certified to 162 PSI



Brighton's new low cost construction of dimple jacketed tanks and reactors saves as much as 25% in cost of labor and material. Sizes in tanks and reactors from 2′ to 12′ in diameter with lengths limited only by shipping restrictions. All Brighton dimple jacket units are certified to 162 PSI. ASME.

Send for free bulletin on Brighton Standard Reactors



BRIGHTON METALSMITHS EST 1914 CORPORATION 820 STATE AVENUE · CINCINNATI 4, OHIO

Check 5826 opposite last page.

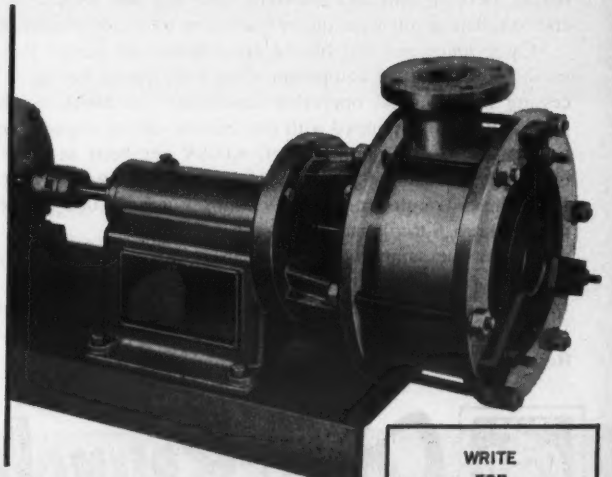
Corrosion Resistant Centrifugal Pumps in PVC and Polypropylene

To Handle HCL, H_2SO_4, Most Acids Plating Solutions and Many Solvents

Wetted parts are constructed of unplasticized, unmodified polyvinyl chloride or Polypropylene. These pumps offer the widest possible range of corrosive resistance, as well as the non-contaminating transfer of sensitive solutions.

A complete line of Vanton Centrifugal pumps is available with capacities 10 through 180 GPM, discharge heads to 160 feet. They cost less and last longer than many special alloy pumps used in similar service applications.

Ruggedly constructed, engineered for efficiency, they have mechanical shaft seals of the latest design in a range of materials to cover all corrosive applications.



WRITE FOR SPECIFICATIONS INFORMATION

VANTON PUMP & EQUIPMENT CORP.
DIVISION OF
COOPER ALLOY CORPORATION · HILLSIDE, NEW JERSEY

VP-109

Check 5827 opposite last page.



FIVE-STAGE EVACTOR AND BOOSTER

NEW TEST CENTER for PROVING and IMPROVING EJECTORS



You are cordially invited to visit this new building devoted entirely to testing, development and research. Here you will see facilities as modern and complete as any existing for the testing of steam jet vacuum equipment.

Floor space and test blocks are sufficient to permit the simultaneous testing of a variety of equipment along with special testing of vacuum processing under actual operating conditions. To assist, we have a steam generating plant equipped with two boilers: one of capacity up to 25,000# per hour at 250# ga; the other, 4,000# per hour at 600# ga. Also: a 60,000-gallon cooling pond and assorted liquid pumps up to 3,000 gpm for both positive pressure and vacuum service; a 4,000 square foot surface condenser; a 6-ton hoist.

Under the same roof for use in research are other types of heavy equipment and laboratory instruments of most accurate design. All together, the facilities of our testing and research center give extra assurance that jet vacuum equipment, fume scrubbers and cooling units from Croll-Reynolds will perform exactly as specified.

CROLL C-R REYNOLDS

Croll-Reynolds CO., INC.

Main Office: 751 Central Avenue, Westfield, N. J.

Chill-VACTORS® • Steam-Jet EVACTORS® • Aqua-VACTORS® • Fume Scrubbers • Special Jet Apparatus

Check 5828 opposite last page.

against the parts, fracturing and removing frozen flash. (See diagram on p. 128 for details of deflasher's operation.)

Results: Deflasher is performing work which formerly required 10 employees. For example, manhours for finishing two- to 16"-ID O-rings (¼" and less sectional diam) have been reduced between 87 and 97%. Finishing time for O-rings (same ID range) with sectional diameter between ¼" and ½" has been cut from 67 to 90%. Average savings for finishing variety of molded parts with diam or diagonals ranging from two to 16" is 60%.

Other cost factors (CO_2, media, depreciation, power and maintenance) offset some labor savings, but deflasher's value is bolstered by bonus benefits of accelerated deflashing and uniformity of deflashing attained.

Largest single cost is for CO_2, but consumption can be controlled so that it is considerably less than that required for deflashing similar parts by tumbling.

As long as operating cycles are properly controlled, breakage is avoided. Acadia has established a complete cycle for each part processed.

Finish on mechanically deflashed parts is at least equal and generally superior to that obtained by previous techniques, Acadia officials report.

An unexpected dividend is use of the deflasher as a quality-control tool. Since the deflasher operates consistently when flash thickness is held to 0.005" or less, variation in quality of deflashing indicates a worn mold cavity. This is spotted during normal inspection procedures.

(Mechanical rubber deflasher is development of Wheelabrator Corporation, Mishawaka, Ind.)

Check 5829 opposite last page.

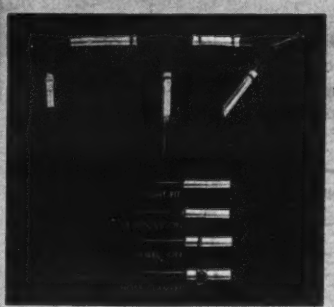
For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Your Best Source of Supply for TUBING CONNECTORS made from

TEFLON*

is

PENNSYLVANIA FLUOROCARBON



PF TUBING CONNECTORS are available for laboratory, glassware and equipment applications in sizes to fit 3 mm through 12 mm glass tubing and in standard lengths of 1¾" with special lengths on request. They save considerable time when connections are to be made and permit misalignment of tubing without restricting flow, are reusable, easy to clean and sterilize. Inexpensive PF tubing connectors are particularly advantageous when the application involves high temperatures, strong solvents or corrosive fluids. They can be attached by wire, cement, hose clamp or tight fit.

PF Tubing connectors are stiff enough for use in vacuum systems without collapsing.

Write, wire or call for a quotation on your requirements. Other PF products made from Teflon include: instrument tubing from .010" I.D. through 1" I.D.; flexible tubing from ⅛" I.D. to 1⅛" I.D.; spaghetti tubing from AWG 0 to AWG No. 32; extruded shapes to customer requirements; rod and heavy walled tubing in standard commercial sizes.

PENNSYLVANIA FLUOROCARBON CO., INC.

1115 N. 38th Street, Phila. 4, Pa.

EVergreen 6-0603 TWX: PH 252

*DuPont registered trademark

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THAT'S INTERESTING

Ions spur ye not

That just about sums up the results of an Air Force study of the effects on human attitudes or ability to perform complex mental tasks when breathing air charged with positive and negative ions.

The study found ion-charged air did not influence behavior.

The report, PB 171 600, may be purchased for 75¢ from Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

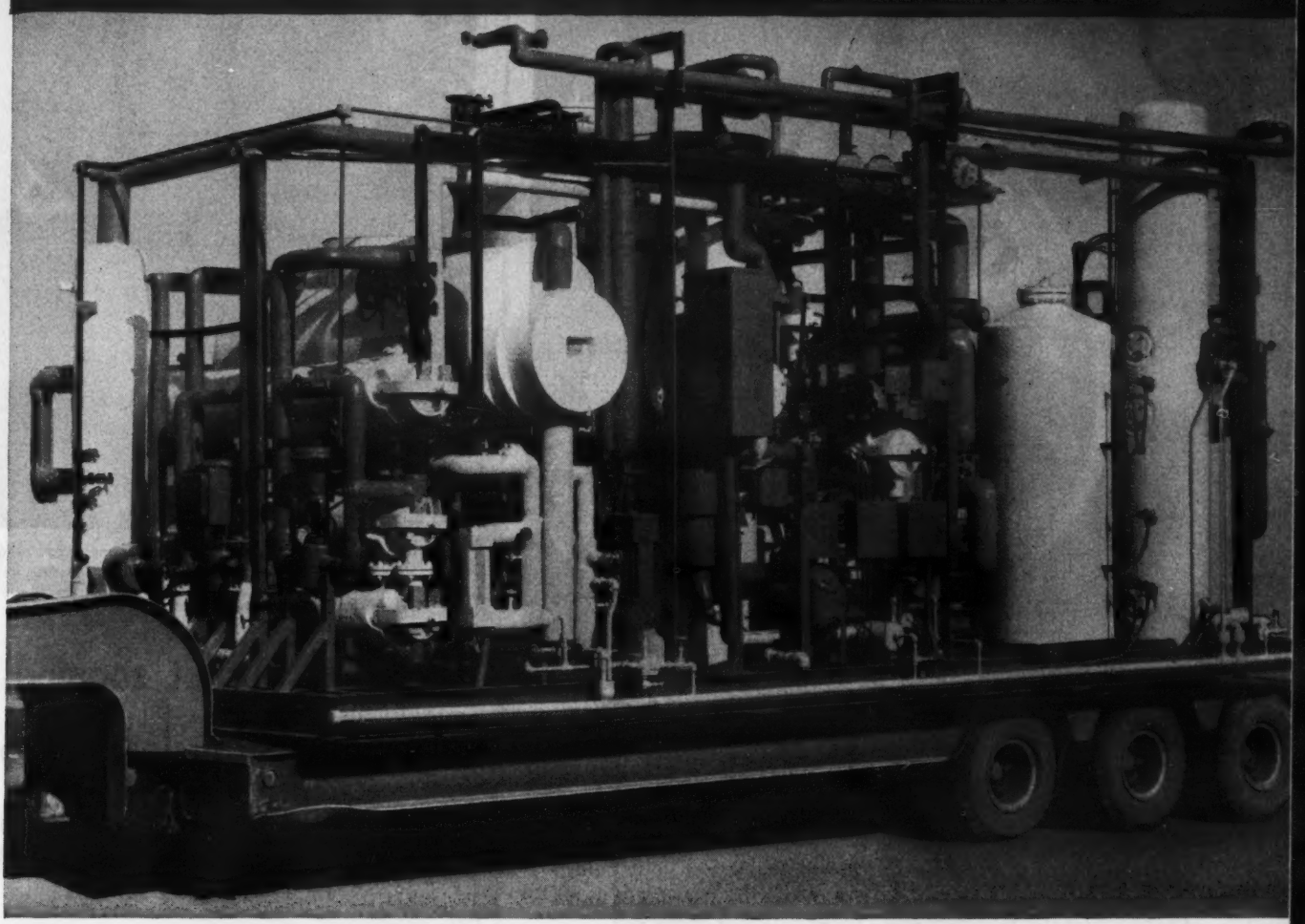
Chemist in a box

An automatic chemist in a little black box is being built by Aerojet-General for shipment to the moon.

Once there, the lunar chromatograph will sample lunar soil and radio back to earth detailed reports on the chemicals it finds. The journey is set for next year.

For more information on product at right, specify 5831 see information request blank opposite last page.

NEW package low cost hydrogen



This compact but complete hydrogen package plant is available in a production range of 5,000 to 25,000 C.F.H. If you now purchase hydrogen or produce it by an obsolete and expensive process, a new Girdler plant will quickly pay for itself by its low production cost. Girdler Compact Hydrogen Plants manufacture high-purity hydrogen from hydrocarbons and steam, and combine the same continuous chemical processes that have made Girdler's field-erected hydrogen plants so well accepted throughout the world. Other Girdler Hygirtol plants are available to suit the very highest volume users. For a complete description of the Girdler process for high purity hydrogen production, write for comprehensive bulletins which include complete descriptive data and flow-sheets.

GIRDLER

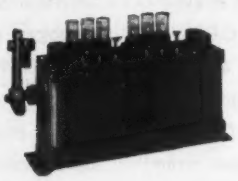
CORPORATION

HOW FAST should you



deliver a drop of oil?

Whether you're operating high-compression diesels or fast-moving shear knives, you're probably paying more and more attention to lubrication *timing*. Whatever your field, our engineers will be glad to study your requirements and make specific recommendations. Your needs can be met either by adapting an existing model — or we will custom-build you your own lubricating system. Write for our catalog. Manzel, 251 Babcock Street, Buffalo 10, New York. You will get exact, on-time lubrication if you



ask the man from

UNIT OF HOUDAILLE INDUSTRIES, INC.

Manzel

SPECIALISTS IN LUBRICATORS AND METERING PUMPS SINCE 1898

Check 5832 opposite last page.



Finely dispersed iron-oxide-coating formula for magnetic tape is here being discharged from vibrating mill

Coating output zoomed 800%; quality leaps, too

Vibrating mill shrinks 80-hr dispersing job to 10 hr; assures top fidelity from magnetic tape

Problem: At this time last year, the quest for ways of making better magnetic tape more economically had apparently led into a dead end for the Magnetic Tape Division of Coleman Electronics, Inc., Gardena, Calif.

A NEW SOLUTIONS FEATURE

Dispersing sub-micron magnetic iron oxide particles in an adhesive binder for coating the plastic base of the tape was an expensive operation producing uncertain results.

It was impossible to guarantee that any two formulae would be the same in consistency and uniformity, Pete Scheirer, division manager, recalls. Variation ranged up to 15% from batch to batch.

A specially-designed 400-gal ball mill, the best equipment then available, was used to grind and disperse the particles.

The ball mill had to be cleaned completely at least once each month—a six-hr stretch of downtime. A switch-over from one formula to another also required shutting down for cleanup.

Grinding media (steel balls) were replaced every six months. Maintenance and parts replacement were substantial.

Solution: Early in 1960, a

vibrating mill was introduced into this country from England, where it had been developed. After investigating, Coleman's Tape Division acquired one in November 1960.

Initial cost was approximately half that of the ball mill. Installation was simply a matter of taking the mill from the truck, placing it on a wooden pallet and connecting it to the power source. The pallet-mounted mill can be moved anywhere in the plant. Since the mill makes little noise and does not transmit vibration, it does not require isolation.

Grinding Chamber, Vibrator Are Basic Components

Basic components of the mill (see CHEMICAL PROCESSING, June 1960, p. 116) are a grinding chamber and vibrator. The chamber is filled with fused alumina cylinders (grinding media) ½" in diam by ½" long. Only moving parts are the motor shaft and bearings.

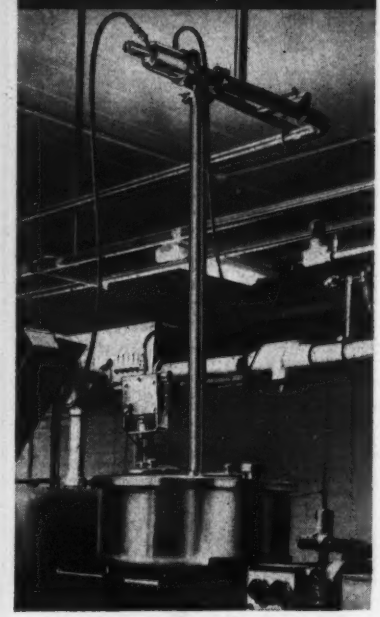
Vibrator is connected rigidly to base members of grinding chamber. The entire assembly is suspended on high-tensile steel springs. "Out of balance" weights are attached to either end of the motor shaft.

In operation, the upper eccentric weight imparts horizontal gyration to the grinding chamber. The lower weight gives gyratory tilt, which causes the chamber's vertical motion. Shock is transmitted from sides and bottom of the chamber to grinding media which impinge on the product being ground. Movement of media is very slight.

The mill is charged simultaneously with one-third-micron iron oxide particles and adhesive binder. High-frequency vibration causes the grinding media to break down agglomerates to uniform particles size and blend them with the binder. Amplitude of vibration can be adjusted to achieve optimum results.

Results: Benefits accruing from the change to the vibrating mill fall into two categories: 1) product improvement and 2) economic. These are presented as follows:

A-P-C
automatic
FLOW CONTROL



POSITIVELY... SHUTS OFF

POSITIVELY... THROTTLES

POSITIVELY... OPENS

Maintains constant liquid level in balance tank, filler bowl or wherever a uniform level is required.

Only with a combination like A-P-C's new Wizard level control and air operated automatic throttling valves can you be guaranteed of safe positive flow control. Protects against container over and under fills; avoids spillage and operates even under severe turbulence.

Look to Alloy Products Corp. for flow control components and systems.

Sold exclusively by the Creamery Package MFG. CO. *for*

ALLOY PRODUCTS CORP.
Stainless Steel Craftsmen Since 1929
1075 PERKINS AVENUE
WAUKESHA, WISCONSIN

Check 5833 opposite last page.

here are
11
GOOD REASONS
why Sprout-Waldron MR 2030 can help you cut costs and boost uniformity in your SIZE REDUCTION operations

Extremely rugged construction—1½" steel plate electrically welded, heavily ribbed, transversely braced and precision machined to insure rigidity.

Heavy duty Timken roller bearings—3¾" diameter suitable for up to 100 hp.

Outboard 3" thick cast steel bearing support flanges — precision machined and fitted with three ring stuffing boxes to keep dust out and grease in.

Extra heavy duty rotor—high tensile steel spiders welded on 7¾" steel shaft. Balanced for high speed operation.

Six or twelve knife rotor—with straight or shear cut design available.

Big screen area (8.4 sq. ft.) achieved by patented top and bottom screen arrangement.

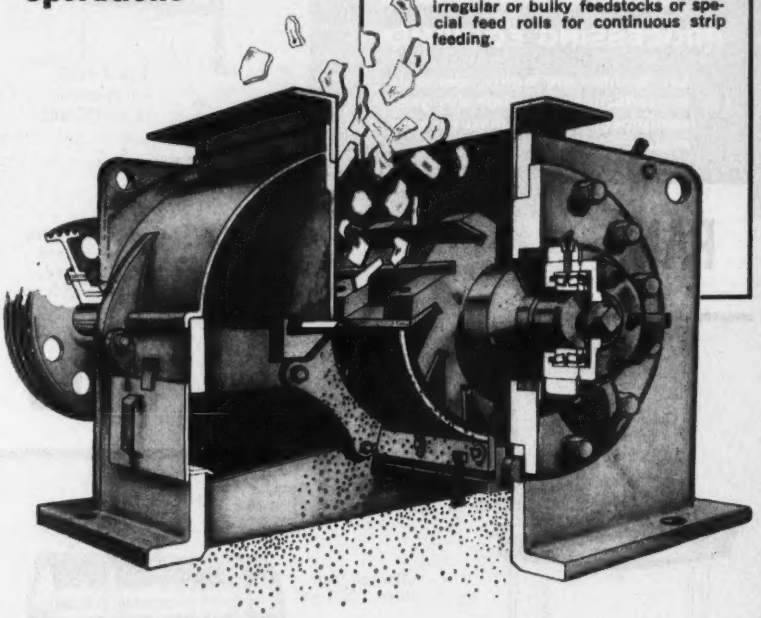
5 strategically placed, stationary knives insure best use of cut and screen principle.

Knives readily adjustable by means of a differential screw.

Easy access to screens and knives through front and back access doors in base and swing hinge cover.

Specially designed shear pin sheave provides protection against machine damage from foreign materials.

Feed versatility—hopper for feeding irregular or bulky feedstocks or special feed rolls for continuous strip feeding.

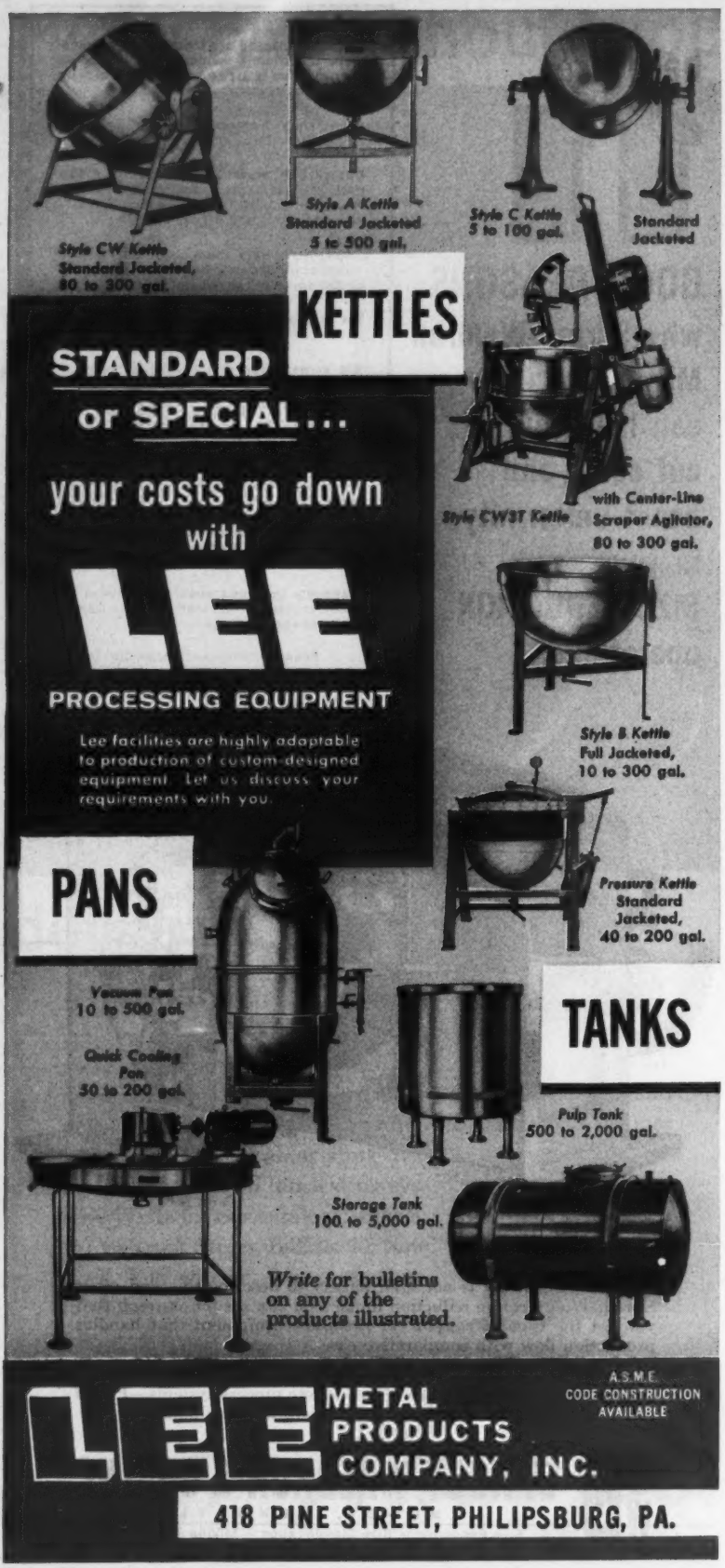


Operating efficiency is not used loosely to describe this and other Sprout-Waldron size reduction units. *You can see for yourself* that you get the type of *rugged yet precision* equipment that handles production flow with comparative ease.

Write for Bulletin 213 for full information. Sprout-Waldron is at your service with single units and complete process systems—*PLUS* technical assistance and cooperative laboratory evaluation.

SW SINCE 1846
SPROUT, WALDRON & CO., INC.
MUNCY, PENNSYLVANIA
Size Reduction • Size Classification • Mixing & Blending
Bulk Material. Handling • Pelleting & Densifying
636

Check 5834 opposite last page.



Check 5835 opposite last page.

IDEAS

Product Improvements

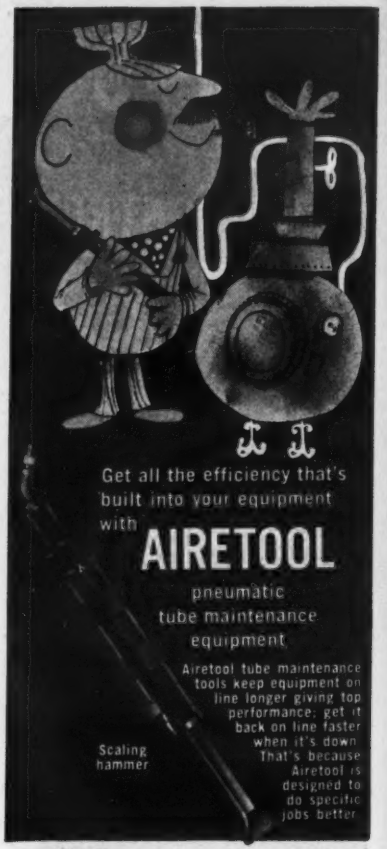
1) Improved tape quality permits recording of original sounds with almost 100% accuracy.
2) Electrical performance of tape improved 25%.
3) Surface of tape is free of agglomerates which cause distorted reproduction and wear of recording heads.
4) Recording of higher range in frequencies and reproduction of those recordings are possible with new tape.

Economic Benefits

1) Dispersion period is reduced from 80 hr to 10 hr.
2) Manhours required for charging and supervising mill reduced by approximately two-thirds.
3) Eight times as much material produced for the same power cost.
4) Downtime is saved. Plant can operate at top capacity constantly. Vibrating mill purges itself completely in 30 min as compared to six hr required for cleaning ball mill.
5) Grinding media, which had to be replaced every six months for the ball mill, are expected to last much longer. Movement of media is slight and grinding time short.
6) Variation in formula is less than 1%, contrasting with 15% previously. Consistency of operation eliminates need for the costly downtime formerly required while formula and tape were tested and graded.
7) The ball mill's life expectancy was three to five years; the vibrating mill is expected to outlast the ball mill.

(Further information about the Vibro-Energy Mill may be obtained from Vibro-Equipment Division, Southwestern Engineering Company, 4800 Santa Fe Ave., Los Angeles 58, Calif.)

Check 5836 opposite last page.

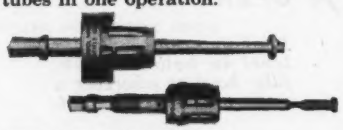


AIRETROL



automatic tube expansion system; one man rolls twelve ½" to 1½" tubes a minute to .001" accuracy. For larger tubes Airetool makes electrically operated expansion systems.

TUBE EXPANDERS
perfect tools for rolling and flaring tubes in one operation.



TUBE CLEANERS
for fast, efficient, removal of the toughest deposits from large and small tubes . . . straight and curved.

EXPANDING BRUSH HEAD CLEANERS with flexible shafts and universal joints . . . for every size tube, straight or curved.

INTERNAL TUBE CUTTERS
speeds tube cutting and removal.

Learn how Airetool can improve the operating efficiency of your heat transfer equipment. Call your Airetool representative for a demonstration. There's no obligation. Or, if you prefer, write us direct.

Representatives in principal cities of the free world



More than 30 years' experience in pneumatic tools

Check 5837 opposite last page.

ILLCO-WAY

FIELD REPORT

COUNTERFLOW*

REGENERATION

THIS PATENTED METHOD PROVIDES MORE EFFICIENT OPERATION OF ION-EXCHANGE EQUIPMENT.

Conventionally, in ion-exchange equipment used for chemical processes, the resin bed is exhausted, or "loaded," by a downward flow of liquid and then regenerated, or "stripped," by a *downward* flow of acid or alkali.

As a result, the lower part of the resin bed is inadequately regenerated, unless a great excess of regenerant is used. Then, during the service cycle, the impurities thus left near the bottom of the resin bed will be leached off into the product. Or, if the resin is used to pick up valuable materials, an incomplete separation will occur. The logical solution would be *up-flow* regeneration, but normally, due to the low density of ion-exchange resins, the bed would rise or expand and there would be insufficient contact of regenerant. With COUNTERFLOW*, however, Illinois Water Treatment Company has achieved successful *up-flow* regeneration by introducing a "barrier" to prevent bed expansion. For example, one method is to introduce water at the top and regenerant at the bottom, drawing both off just above the resin bed.

Substantial improvements result from COUNTERFLOW* — resin capacity increased as much as 25%, leakage of impurities reduced as much as 75%. Where the resin is used to pick up valuable materials, COUNTERFLOW* "stripping" gives more complete separation without increased dilution.

*COUNTERFLOW *is the trademark of Illinois Water Treatment Company equipment utilizing an up-flow method of regeneration with a "barrier" to keep the bed from expanding. U.S. Patent No. 2,891,007.*

For detailed information, address:

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST., ROCKFORD, ILLINOIS
NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

Check 5838 opposite last page.

CUT HERE AND FILE

Viscosity of Suspensions

DANIEL S. WILT and HERMAN F. REINHOLD JR.
Hercules Powder Company Parlin, N. J.

In their series of papers on estimating physical properties and thermodynamic data, Johnson and Huang suggested the following equations for estimating the viscosity of a suspension of solids in a liquid for use in fluid-flow and heat-transfer calculations when experimental data are not available:

for volume fraction of solids $\leq$ 0.1, Einstein's equation:

$$\mu = \mu_0(1 + 2.5X_D)$$

and for 0.5 $\leq$ volume fraction of solids $\leq$ 0.9, Hatschek's equation:

$$\mu = \frac{\mu_0}{1 - X_D^{0.33}}$$

where: X_D = volume fraction of solids in suspension
μ = viscosity of suspension, cp
μ_0 = viscosity of liquid, cp

Although Einstein's equation was derived for dilute suspensions of spherical solids, it has also been applied to emulsions. The accompanying nomographs provide rapid solutions of the preceding equations. (Any consistent units of viscosity may be used.)

Typical Example

Example 1 — 0.04 volume-fraction of solids are added to a 10-cp — viscosity liquid. What will be the resulting viscosity? On nomograph of Fig. 1, connect 0.04 on the X_D-scale with 10 on the μ_0-scale, and read 11 cp on the μ-scale.

Example 2 — 0.7 volume-fraction of solids are slurried in a liquid of one-cp viscosity. What will be the slurry viscosity? On nomograph of Fig. 2, connect 0.7 on the X_D-scale with 1.0 on the μ_0-scale and read nine cp on the μ-scale.

nomographs on page 137

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Inert gas now available via rented generators

Uses: Producing inert-gas for purging and blanketing operations in petroleum and chemical industries.

Features: Generators are portable and can be used on site to produce up to million cu ft inert-gas/day. They can be rented with trained personnel to operate them on hourly basis.

Description: Generators are compact units, mounted on trailers, and require no external connections for water or electricity. They produce mixture of nitrogen, carbon dioxide and argon, which is free of impurities.

(Inert-gas generators are manufactured by and available for rent from Inert Gas, Inc., 5405 Clinton Dr., Houston 6, Tex.)

Check 5839 opposite last page.

Tailor-made slide rules possible with kit

With a recently introduced kit, you can design and construct your own special-purpose slide rule for doing recurring calculations connected with your job.

Kit contains three basic slide rule blanks, plastic scale plotting ruler, universal logarithmic chart and 25-page instructional booklet.

(Special-purpose slide rule kit is a development of Dyna-Slide Company, 600 S. Michigan Ave., Chicago 5, Ill.)

Check 5840 opposite last page.

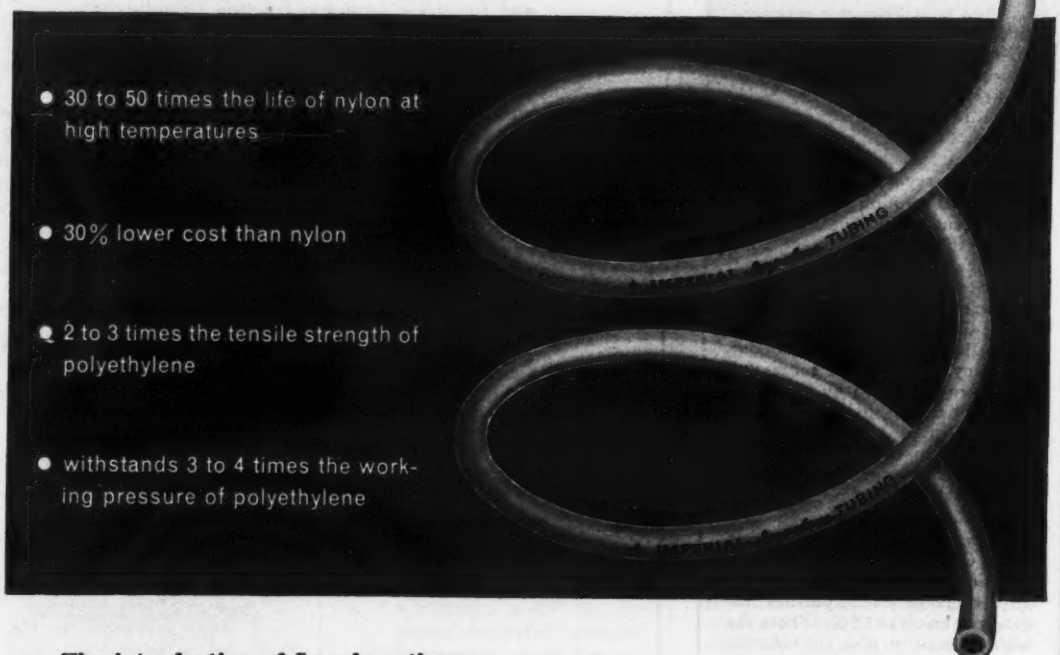


new

Impolene

stabilized polypropylene

tubing



The introduction of Impolene thermoplastic tubing foretells major improvements in the transmission of air and fluids. This Imperial-Eastman stabilized polypropylene tubing now has many proved uses. Many more await it. What's yours? For complete data, write for Impolene Bulletin No. 301.

IMPOLENE

IMPERIAL EASTMAN

Imperial-Eastman Corporation General Offices: 6300 West Howard Street, Chicago 48, Illinois

In Canada: Imperial-Eastman Corporation (Canada) Ltd., P.O. Box 645, Barrie, Ontario

new

Impolene

with *new* advantages, many *new* uses

High tensile strength. Highest strength-to-weight ratio of all thermoplastic tubing. Working pressures compare favorably with nylon—are 3 to 4 times greater than polyethylene.

Excellent corrosion-resistance. Resists concentrated hydrochloric acid up to the boiling point. Withstands saline solutions at temperatures over 212° F. Shows no detrimental effects in boiling sulfuric acid.

Wide temperature range. Can be used up to 300° F. Has 30 to 50 times the life of nylon at elevated temperatures. Remains flexible at −100° F.

Good abrasion-resistance. High surface hardness gives it much better abrasion-resistance than most thermoplastics.

Odorless . . . tasteless . . . resists sunlight. Approved by the FDA and NSF for food and drinking water applications.

Use Impolene tubing for air lines, control panels, instrumentation and lubrication systems, processing and construction machinery—many other uses.

Available in 500′ to 1000′ spools in O.D. from ⅛″ to ⅜″. Other sizes available on special order.

Poly-Flo Fittings—designed for use with all plastic tubing, yet usable with soft metal tubing. Withstand pressures beyond burst strength of tubing. Available in a complete range of sizes and styles.



New Imperial-Eastman meets all your requirements for hydraulic-pneumatic-flow system components: tube fittings, valves, couplings, flexible and rigid hydraulic and pneumatic lines, thermoplastic tubing, tubing tools.

TUBING

IMPERIAL — EASTMAN

Check 5841 opposite last page.

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Viscosity of Suspensions

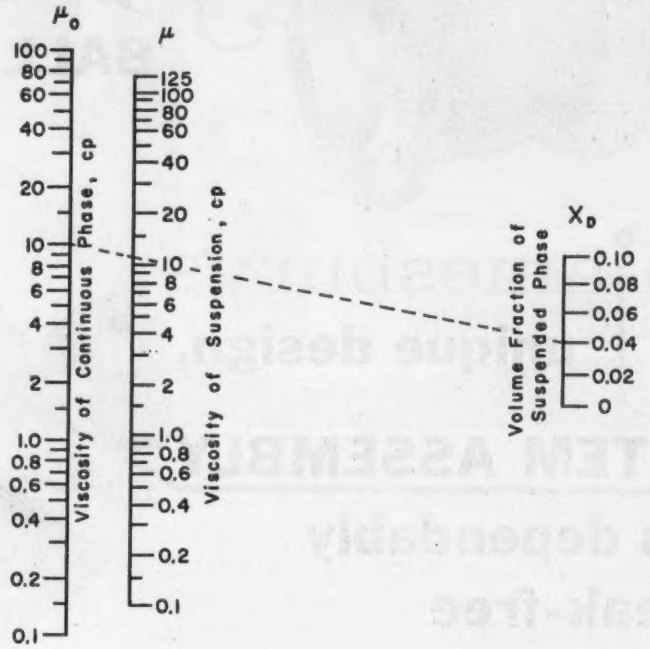


Fig 1

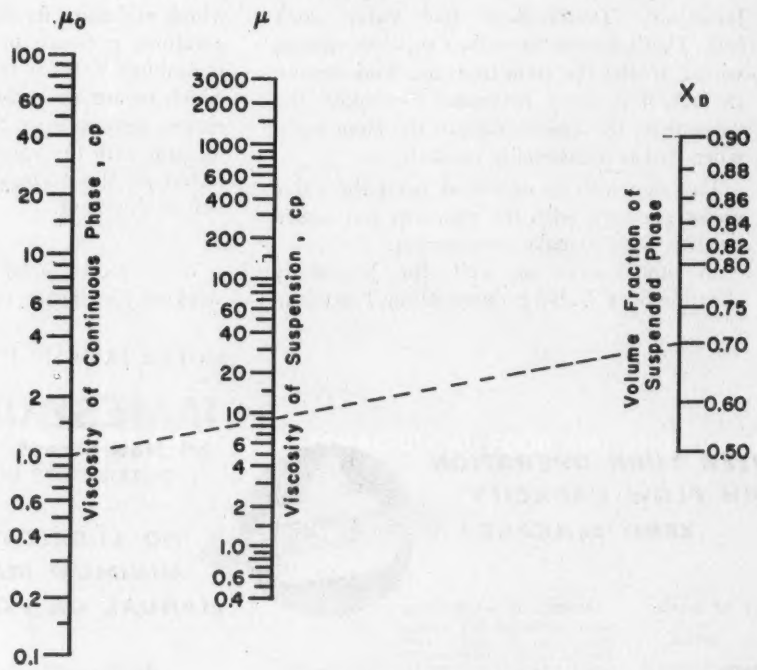


Fig 2

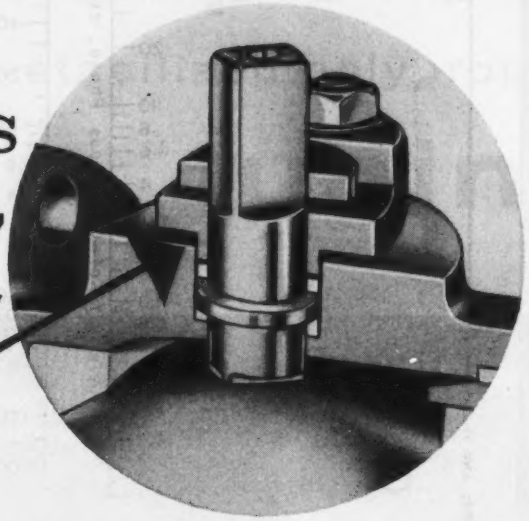
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FACTS You Should Know About



jamesbury
"Double-Seal"™
BALL VALVES*
*PATENTED

Due to jamesbury's unique design, the STEM ASSEMBLY is dependably leak-free



Even if you take the stem out entirely, the Jamesbury "Double-Seal" Ball Valve won't leak. That's due to the valve's superior design, which isolates the stem from the fluid stream. In fact, it is never necessary to remove the valve from the line to replace the stem seals, when this is occasionally needed.

The stem can be removed from the valve under pressure with the valve in full closed position with no leakage occurring.

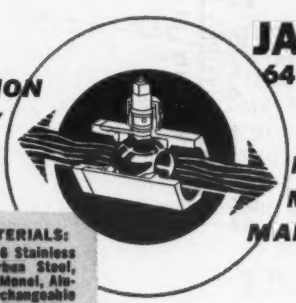
In other ways, as well, the Jamesbury "Double-Seal" Valve is outstanding. For example, there's the Jamesbury patented lip seal which maintains its tight closure despite temperature, pressure or wear. Then, too, the Jamesbury Valve is of unit body construction which means no body joints. Also, when you choose remote operators, these are mounted integral with the valve — assembled and pretested at the factory along with the valve before shipment.

Want more facts? Contact your nearest stocking distributor, or write us direct.

Send for JAMESBURY Fluid Services Guide

JAMESBURY CORP.
64 New Street, Worcester, Mass.
DISTRIBUTORS IN PRINCIPAL CITIES

QUARTER TURN OPERATION
HIGH FLOW CAPACITY
ZERO LEAKAGE



NO LUBRICATION REQUIRED
MINIMUM MAINTENANCE
MANUAL OR POWER OPERATION

As Versatile As Industry Itself!

WIDE RANGE OF SIZES:
Screwed end ¼" through 3".
Flanged 150# series ½" through 12" — 300# ½" through 8".
Larger sizes on request.

VARIETY OF MATERIALS:
Valves in 303 and 316 Stainless Steel, Alloy 20, Carbon Steel, Bronze, Ductile Iron, Monel, Aluminum and PVC. Interchangeable seats and seals in Teflon, Teflon compounds, Nylon, Buna-N, Neoprene, Hypalon and natural rubbers.

©Jamesbury Corp. 1961 177-1

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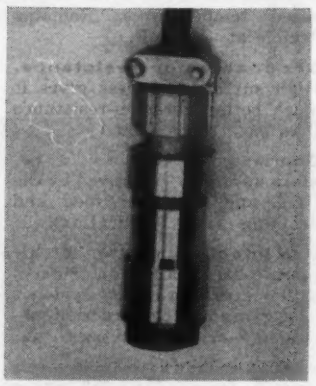
IDEAS

Transducers are accurate at 1000°F ambient temp and resist radiation

Uses: Measuring pressures with ambient temperatures as high as 1000°F and/or in radioactive situations.

Features: Transducers provide nominal full-scale output of 200 millivolts with accuracy of 2½% over range from −65 to 1000°F. "Symmetry-sensing circuit" makes output independent of line voltage and temp variations.

Description: Complete, one-channel system consists of the transmitter, oscillator, power supply and symmetry-sensing



Radiation-resistant pressure transducer can be used here or inside reactor core, in contact with molten metal or close to the exhaust of rockets

circuit module. Units are available with full-scale measurement ranging from 0.6 to 5000 psi.

Information is passed in the form of a varying magnetic field rather than through mechanical linkage. Only materials contacting pressure medium are stainless steel, Inconel and Inconel-X or PH15-7MO. Construction minimizes differential expansion and temp gradients.

Full-scale linearity is ± 0.5%. Resonant frequency varies from 200 to 2000 cps depending on pressure range.

(Ultradyne Series 411 pressure transducers are being introduced by Consolidated Controls Corporation, subsidiary of Consolidated Diesel Electric Corporation, Bethel, Conn.)

Check 5843 opposite last page.

THAT'S INTERESTING

Ultrasmall transistor

An ultraminiature transistor, so small that up to 20,000 could fit on a postage stamp, has been developed by Radio Corporation of America.

The transistor is made by depositing thin films by evaporation on an insulating base. It is capable of shrinking the basic circuitry of a computer to the size of a book page.

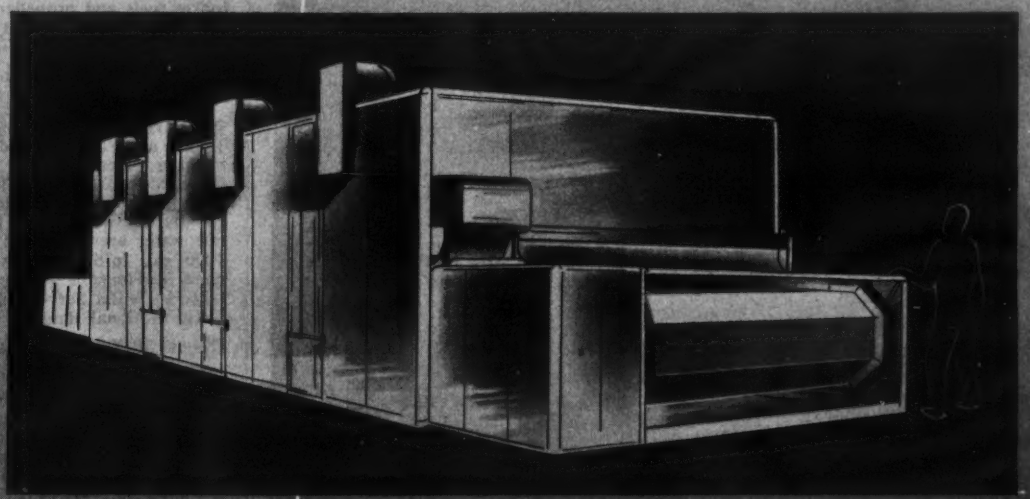
Stitch in time

The age-old craft of quilting is finding a role in the atomic age!

At Argonne National Laboratory, Mrs. Ulysse McGee has been given task of quilting and cutting pieces of glass fiber cloth which will become integral parts of the Zero Gradient Proton Synchroton particle accelerator, i.e., "atom smasher."

For more information on product at right, specify 5844 see information request blank opposite last page.

THIS IS "NATIONAL"...



The science of drying engineered to the highest efficiency and productivity in an APRON CONVEYOR DRYER for processing a wide variety of products . . . chemicals, pharmaceuticals, synthetic fibres, hair, rubber crumb, starch, foods, etc.

"NATIONAL" Guarantees Greater Yield—through:

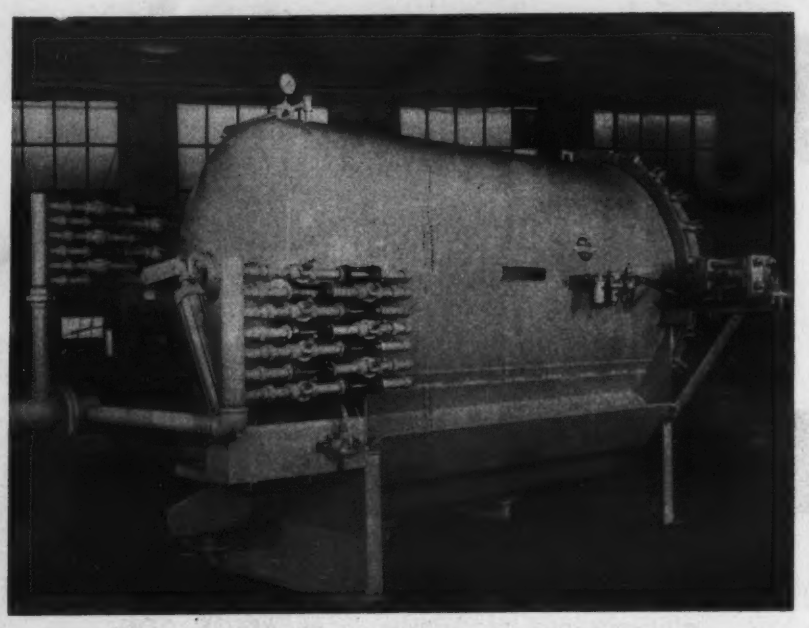
- A full analysis of your drying problem by a team of experts
- Laboratory facilities and pilot plant testing equipment
- Drying equipment engineered to meet your specific requirements
- Installation supervised by "NATIONAL" engineers
- Prompt service and spare parts

DRYING MACHINERY FOR THE TEXTILE, CHEMICAL, PHARMACEUTICAL, FOOD AND OTHER INDUSTRIES

NATIONAL

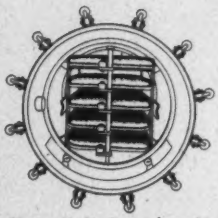
FORTY-FIRST YEAR • INSTALLATIONS AROUND THE WORLD

Sparkler Filtration Specialists . . . . . **CUT COSTS***

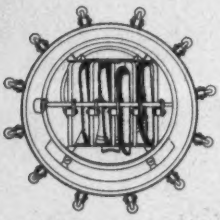


Better Filtration · Easier Cleaning · Less Labor

with Sparkler HRC Automatic Filter



Plates in horizontal position during precoating, filtering, washing and blow down.



Plates rotate to vertical for fast, thorough cleaning.

Sparkler has combined the efficiency of Horizontal Plate Filtering with the convenience of Vertical Plate Cleaning in the Model HRC. Horizontal filter plates provide complete support for uniform precoat and filtration. The thickest cake will not slip or crack in case of interrupted flow.

For fast, thorough cleaning the plates in the Model HRC rotate to the vertical and the spent cake drops off quickly and cleanly when vibrated. A screw conveyor removes the cake. (Available without the screw conveyor for liquid slurry discharge.)

The Model HRC need never be opened, making it ideal for toxic products or where sterile conditions are essential. It is available in sizes up to 500 sq. ft. of filtering area. Complete specifications sent on request. Engineering to meet individual product characteristics assures optimum performance in any installation, either completely or semi-automatic.

*Write us for cost cutting recommendations on your present or planned filtering operations.

SPARKLER diatomite FILTERS

288

SPARKLER MANUFACTURING COMPANY

Conroe, Texas

Sparkler International Ltd. manufacturing plants in: Canada; Holland; Australia; Italy; Brazil; Mexico

Filtration Engineers Exclusively for Over 36 Years

Check 5845 opposite last page.

NEW LITERATURE
Ideas and New Trends

Computer service for evaluating rocket fuels and propellants is described in Tech Bul 101 — The Service Bureau Corporation.

Check 5846 opposite last page.

Water resources of the Houston, Texas, area are covered in two bulletins. Area now has 1800 million gpd of water available; expects to have over four billion gpd by end of century. Rates for raw water are as low as 1.2c per 1000 gal. Information is summarized in Houston Water Bul; detailed in Water Survey Bul — The Texas National Bank of Houston.

Check 5847 opposite last page.

How to cope with reading load posed by ever-growing number of business and trade publications is topic of booklet entitled "Why, When and How to Read Business Publications" — Fred Wittner Company, Inc.

Check 5848 opposite last page.

Inhibitor sweetening of gasoline stocks with a phenylenediamine-type antioxidant is subject of Bul I-III — Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company.

Check 5849 opposite last page.

Short cuts in designing holding magnets and assemblies are outlined in four-page Holding Magnet Design Bul — Indiana Steel Products Division, Indiana General Corporation.

Check 5850 opposite last page.

Control of flies, is covered in 35-page booklet for formulators. Bul F-40728 — Crag Agricultural Chemicals, Union Carbide Chemicals Company, division of Union Carbide Corporation.

Check 5851 opposite last page.

Self-training in human relations, as another step in professional advancement for engineers, is offered in Booklet E-7 — Heat Exchanger Division, Western Supply Company.

Check 5852 opposite last page.

General background on processes available, range and scope of activities and other information about firm are presented in 24-page brochure. Among major processes are nitric acid, ammonium nitrate solutions, prilled ammonium nitrate, nitro-phosphate process and spherodizer process. Brochure may be obtained by writing on letterhead to The Chemical and Industrial Corp., 256 McCullough St., Cincinnati 26, Ohio.

Young

BUILDS THE BEST HEAT EXCHANGERS

AIR COOLED OIL COOLERS



Type "OH" Unit

Cooling oil and space heating, when desired, are dual advantages of Young "OH" units. Available in ten sizes. Catalog No. 3560.

LIQUID COOLED HEAT EXCHANGERS

FIXED TUBE BUNDLE



Single Pass Model

Two Pass Model

Four Pass Model

Type "F" heat exchangers are made in copper base alloy, steel or stainless steel construction. Over 400 standard models. Catalog 1261.

REMOVABLE BUNDLE



Young type "R" heat exchangers are made in standard sizes. Quality-built for dependable performance. Low cost. Catalog No. 1160.

Young heat exchangers are used on all types of hydraulic equipment and in chemical, pharmaceutical and food processing equipment—can be furnished to ASME specifications.

Write Dept. J-371 for catalog required

YOUNG RADIATOR COMPANY

RACINE, WISCONSIN

Plants at Racine, Wis. and Mattoon, Ill.

Check 5853 opposite last page.

Valve Your Tank Farm for SAFETY

Here's how GE's Silicone Products Department did it economically

CHARLES W. CONKLIN
Project Engineer
Silicone Products Department
General Electric Company
Waterford, N.Y.



***Remote master** three-way valve is designed to enable operator to shut all six tank-farm valves at once in event of emergency*

A prime objective in fighting any tank-farm fire is shutting off fuel feeding the fire. For this reason, General Electric Company's Silicone Products Department recently made a study to determine the most economical method of installing remote-operating shut-off valves at the bottoms of their storage tanks.

A NEW SOLUTIONS FEATURE

What was desired was a system which could be used to shut off remotely the tank-bottom valves in case of fire and which would also keep them shut under ensuing high-temperature conditions.

Main materials being stored in the tank farms are chlorosilanes—basic intermediates for silicone production. Chlorosilanes are not easy to handle because they are not only flammable, but corrosive. Too, they liberate HCl fumes when brought into contact with water. Other materials stored in these same tank farms may be flammable and/or toxic (e.g., benzene and toluene).

Three ways to go. There were three possible solutions considered. First is mechanical. A quick-opening-and-closing valve is manually closed by chain or lever system. In a chlorosilane tank farm, however, such a set-up is subject to severe corrosion and is not reliable.

A second approach is to install an explosion-proof electrical system using remote switches and solenoid valves. This works, but is expensive. A third alternative is to use a pneumatic system made from readily available parts.

Pneumatic wins nod. The pneumatic technique was ear-marked by the study as the best system. Since its successful installation on one tank farm, it has come into general use at the GE silicone plant.

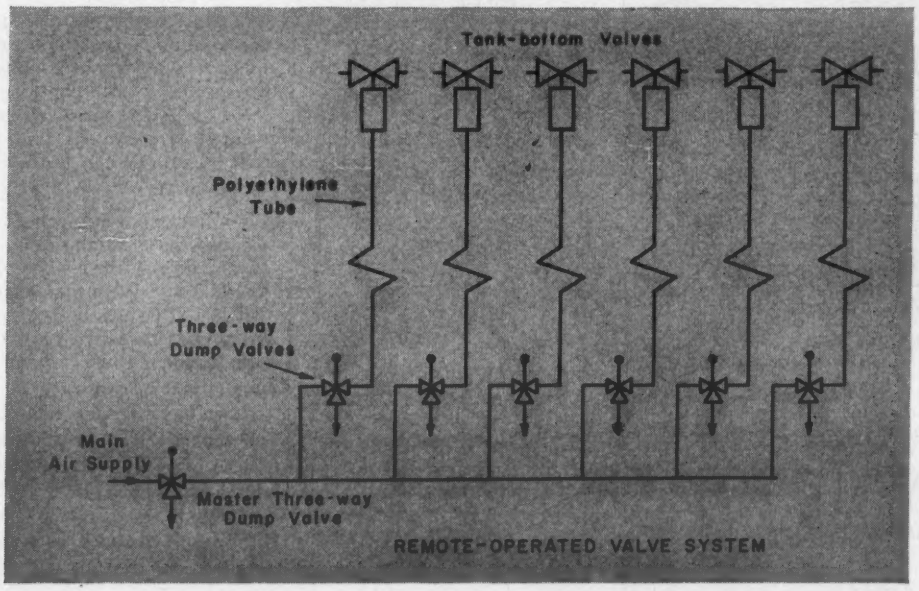
The initial installation was made on a six-tank farm. (See diagram.) Installed under each tank is an air-operated valve designed to close with spring closure upon air failure.

Strength of the motor spring is such that it holds the valve shut against a combined static and dynamic head of liquid in tank or process line. Because of special hazards involved, this particular design calls for tungsten-steel springs rather than the normal carbon-steel type because tungsten is considered better able to maintain coil strength at high temperatures.

The second part of the system is in-

To next page

Diagram shows placement of shut-off valves and fail-safe equipment in a tank farm of General Electric's silicone plant in Waterford, N.Y. Six three-way dump valves indicated near bottom control air supply to individual tanks and can be used to shut off flow to selected tanks as required. Master valve at lower left is reserved for emergency situations. It can be used to isolate all tanks simultaneously from plant stream. Further safeguards are individual polyethylene air-supply lines located near valves beneath each tank. They "fail safe" and automatically shut off valves in event of sudden disaster.



POWELL MAKES IT A SIMPLE MATTER

To find the right valve for chemical installations, just call Powell. It's that simple since Powell offers industry's most complete line of valve materials, both ferrous and non-ferrous, to withstand virtually any problem of corrosion, erosion, temperature or pressure.

What's more, you don't have to wonder about Powell performance. It's built-in through sound engineering, development, materials and workmanship.

So, remember, finding the right valve can be a simple matter when you specify Powell Valves. For further information, call your nearby Powell Valve Distributor (there's one in every major city), or write us direct.



115th year of manufacturing industrial valves for the free world

POWELL CORROSION RESISTANT **VALVES**

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

Check 5854 opposite last page.

dividual three-way air valves which operate each of six tank valves. These are standard and are available on the market. They are commonly used in hydraulic systems. Valves either supply air to the main cylinder of the tank valve or unload it by dumping cylinder air to atmosphere.

In series with all six three-way valves, a single master three-way dump valve is installed somewhat more remote to the tank farm. In normal operation, operators can manipulate any one of single three-way valves to open or close the desired tank valve. Should an emergency arise, all that is needed to shut all six tank-farm valves is the pulling of a master three-way valve.

Failure spells success. Automatic fire protection is built into the system by means of a polyethylene tube which is used as a pneumatic-transmission line between each three-way valve and air-operated valve beneath the tank.

Polyethylene is flammable and will soften under heat. Both these features are desirable in that they enhance failure or rupture of air line when it is exposed to heat of fire. Tests have shown that the polyethylene will fail within a matter of minutes when subjected to heat produced from a fire.

This tube failure causes automatic closing of main-tank valves under disaster conditions. A system that is entirely fire-proof is not what is desired in this case. What is wanted is a system that will fail in fire. When it fails, it fails safe.

One drop is too much. Shut-off valves on tank-farm systems can be either standard pneumatic diaphragm-control valves with positive shut-off, or any other valve of ball or plug type which accepts a pneumatic operator.

Two basic models have been used at GE. One is a standard control valve with low pressure drop and positive shut-off. When this one is used, a three-way trigger valve is installed on the diaphragm to



ECO ENGINEERING NEWS

the big name in small pumps for the process industries

Who Pumps What with ECO

Butyl chloride. A major refiner of light metals and chemical producer uses Hastelloy* C GEARCHEM Pumps with Penton× spur gears to pump butyl chloride.

Hexachloropentadiene. The Royal Dutch Shell Co. in Holland pumps hexachloropentadiene with a GEARCHEM Pump constructed of nickel with Teflon† gears.

Calcium chloride brine. Pumping calcium chloride brine at —60° F is the chilly job of 316 stainless steel GEARCHEM Pumps with Teflon gears at the New England plant of an electronic tube manufacturer.

Potassium sulfite slurry. An industrial research laboratory handles a four percent slurry of potassium sulfite at 300° F with a pedestal-mounted CENTRI-CHEM Pump in Carpenter 20 stainless steel with semi-open impeller.

Hot caustic. A leading manufacturer of synthetic textiles required an Eco GEARCHEM Pump with nickel housing and Hastelloy C gears to pump 73 percent caustic at 259° F against 75 psi.

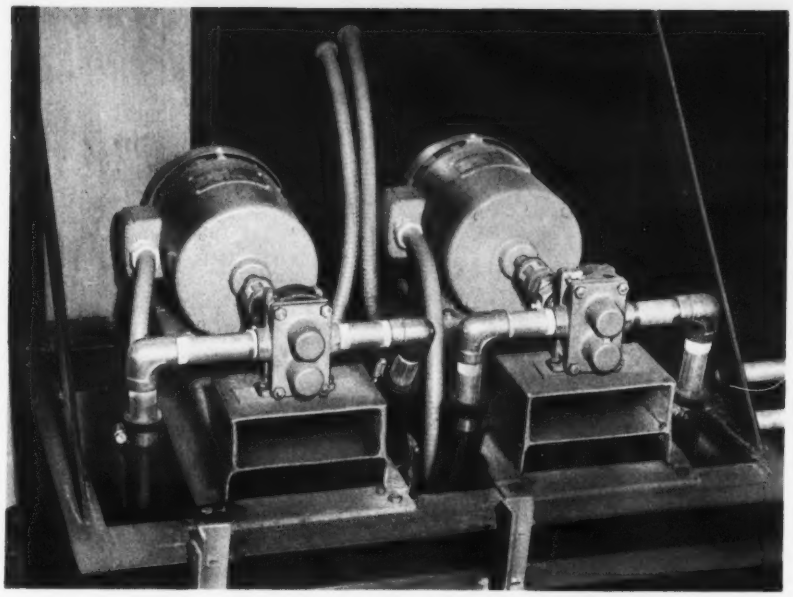
DuPont acrylic resin RK-6305. Major electric motor manufacturer uses Eco GEARCHEM Pumps to move DuPont's acrylic resin RK-6305. The resin is diluted but still has a viscosity of 600 SSU when handled by the Eco Pump. Also, most electrical manufacturers (names on request) also use this same pump in 316 stainless steel with Teflon gears to pump DuPont's ML Polymer Wire Enamel.

And Here are a Few "Wide and Outside"

All within a day, bonafide orders for these following pump applications arrived by post, phone and telegram.

Problem	Answer
Cyclopentadiene	Nickel Gear Pumps
Di-methyl formamide & Toluene	316 SS Gear Pumps
Lithium-Bromide	Nickel and Stainless Pumps with Rubber Gears
Polyvinylalcohol adhesive, 1800 Cps Vis	316 SS Gear Pumps
Methane Diamine, viscosity of about 100 Cps	316 SS Gear Pumps
Toluene Diisocyanate	316 SS Gear Pumps
Triethyleneglycol-diacrylate	316 SS Gear Pumps
Methylisobutylketone	316 SS Gear Pumps
Monoethanolamine	316 SS Gear Pumps
Monochlornaphthalene	316 SS Gear Pumps
Peracetic Acid	316 SS All-Chem Pumps

This is highly explosive and detonation prone.



Plating the Pictures for New York Newspapers

Garden Photoengraving Co., Mineola, N. Y., specializes in fast, overnight service in preparing zinc plates for lithographic reproductions in metropolitan New York newspapers. Using the Dow powderless etching process, this plant consumes an average of 40 gallons of 42° Baumé nitric acid per 2 shifts each night.

Formerly, the concentrated acid was purchased in stainless steel carboys of sizes weighing 165 to 600 pounds. Handling the carboys of HNO_3 was not only back-breaking work, but was also dangerous and costly. Mr. Leon Standley, President of Garden Photoengraving, investigated the economics and feasibility of bulk purchases of nitric acid and learned that the resulting savings in the cost of the acid would pay for the necessary safe handling system within a year's time. In fact, the refunded deposits on the stainless steel carboys paid for one of the two 1200-gallon stainless steel acid storage tanks installed just outside the etching room to receive the bulk acid by tank truck shipment.

From there on, two 316 stainless steel GEARCHEM Pumps with Teflon Gears and special grease sealed lantern ring stuffing boxes, illustrated above, draw the acid from outside storage tanks and transfer it, as needed, to the four head tanks—from which it flows to two holding tanks in constant temperature baths which maintain the acid at 70° F for subsequent safe dilution with water and organic chemicals. Then a ⅜" GEARCHEM Pump transfers the acid to a measuring tank where it is diluted to the proper concentrations and from which it flows by gravity to the etching machines as needed.

Plates are etched in three Chemco machines, and in each machine the etching solution is recirculated by Eco CENTRI-CHEM Pumps installed as original equipment by Chemco Co., Glen Cove, N. Y. Thus there are six Eco pumps handling nitric acid daily for Garden Photoengraving.

Pleased plant engineer Ed Klemert says of the new system, "Now Eco does the lifting." All anyone has to do to fill the head tanks is push a button. And when the plant is particularly busy at night, it is no longer necessary for the etchers to draw a pitcher or two of concentrated acid from the awkward and dangerous carboys to finish their work. Instead they, too, can simply push a button and have the Eco Pumps handle the acid for them.

*Union Carbide Trademark. †du Pont Trademark. ×Hercules Powder Trademark.

ECO ENGINEERING NEWS

Kawecki Uses GEARCHEM Pump To Fill Orders For Rare Chemicals

Kawecki Chemical Co. was founded 11 years ago to produce potassium zirconium fluoride and potassium titanium fluoride used primarily to improve the properties of aluminum. Pioneering in exotic metals and their compounds, Kawecki quickly developed processing knowhow that enables it to supply bulk quantities of high purity metals and rare metal chemicals including many that were laboratory curiosities just a few years ago. Tantalum, which is used in the manufacture of capacitors and corrosion resistant equipment, now accounts for a large portion of the Kawecki sales income, but Kawecki still produces and sells many different alkali double fluorides such as potassium columbium fluoride, sodium silico fluoride, potassium tantalum fluoride, calcium titanium fluoride and ammonium zirconium fluoride to mention a few.

Needing large amounts of hydrofluoric acid to process the high purity metals and to make these rare metal fluorides, Kawecki engineers ran into the usual difficult corrosion problems associated with handling HF solutions. Pumps transferring cold, 70 percent solutions of HF against heads to 40 feet lasted only six months at the most. But then Kawecki learned that Eco offered a GEARCHEM Pump in Hastelloy C with carbon bearings and wear plates that was highly recommended for handling HF under similar conditions existing in their Boyertown, Pa. processing plant.

GEARCHEM Pumps were substituted last July, and 10 months later they show no signs of succumbing to the same fate as previous pumps. Besides good service life, the GEARCHEM Pumps have an added advantage for Kawecki for they do not require priming. Previous pump had to be primed with lubricating oil which was potentially detrimental to the high purity of the rare metals and chemicals. By installing GEARCHEM Pumps, Kawecki eliminated the contamination and corrosion problems for good.

Low Cost Flow Control Instrumentation

It has become a known fact that Eco GEARCHEM Pumps with Vickers variable speed transmissions, and equipped with Rotometers can supply highly dependable, precise and reproducible flow control instrumentation at a fraction of the cost of conventional instrumentation and expensive, custom-built metering pumps.

Several outstanding plants are now standardizing upon this Eco-Vickers-Rotometer combination which supplies the linear, constant flow for the essential, dependable metering of a wide variety of media.

New Bulletin on Eco Pump Drives and Accessories

Almost always it pays to use the drives, base plates, couplings and other accessories which have been designed especially for use with a particular pump design—because a great deal of thought and skill has been expended to make such accessories most suitable and adaptable to the various applications of the pump. And, contracted in volume or mass produced at Eco, they are generally more economical to purchase than from any other source (or to improvise in your own plant).

Bulletin PD-760 describes all standard drives for All-Chem, Gearchem, Minilab and Centri-Chem Pumps—direct connected electric motor; air motor; pulley and sprocket drives; variable speed belt, hydraulic and mechanical types. It also features new channel and cast drip rim bases, precision pump mounting blocks, corrosion resistant couplings, portable pumping units, etc.

Ask for your free copy.

KIWI Takes a Shine to Eco Pumps

KIWI Shoe Polish Company of Pottstown, Pa. recently bought another Eco rotary displacement pump in stainless steel with neoprene impellers for handling abrasive titanium dioxide slurry.

KIWI, nationally known and highly regarded member of the spit-and-polish society of meticulous dressers, are well pleased with Eco Pump performance.

900 GEARCHEM Pumps Prove Out in Viscous Service

The brawny member of the hard-to-beat GEARCHEM family, the Series 900 pump is developing an excellent reputation for handling viscous solutions.

Operating at 300 rpm, a Series 900 GEARCHEM pumps a 30 percent solution of sodium lauryl sulfate with a viscosity of 5000 centipoises at 120° F.

Constructed of 316 stainless steel with Hastelloy C dual spur gears and carbon bearings, this pump has 1½ inch ports to move the thick solution at 7 gpm. This top performance is only one example of what the Series 900 GEARCHEM Pumps can do. Providing discharge pressures to 150 psi, they will pump 1000 SSU oils at rates to 27 gpm and will handle higher viscosities to 50,000 SSU at lower capacities.

Poisonous Vapor Leaks Stopped with Eco T-Film

Each month the mercury purification still at the acid plant of National Zinc Company, Inc., Bartlesville, Oklahoma is dismantled for inventory and cleaning. Formerly when the still was placed back in operation, pipefitters were beside themselves trying to seal the threaded connections to the still against the mercury vapor leaks at temperatures above 675° F. It was necessary on some occasions to remake the connections two or three times before the leaks were sealed.

Then Mr. W. B. Burchfield, Pipefitter Foreman, decided to try T-FILM as a sealant even though Eco Engineering Company does not recommend this Teflon compound for temperatures above 600° F. The T-FILM worked beautifully, and the pipefitters haven't had to remake any leaking connections since they started to use T-FILM.

And speaking of T-FILM, the big stories NOT FOR PUBLICATION are the thousands of dollars worth of this product utilized by the defense department, selected in preference to all other sealants, for certain rocketry requirements.

Another interesting note is that safety engineering departments of large oxygen producers are recommending T-FILM for liquid and gaseous oxygen systems operating at 2500 psig and over.

Remote Chemical Plant Depends on Eco GEARCHEM

Arapahoe Chemicals, Inc., Boulder, Colorado uses a 400 Series GEARCHEM Pump for muriatic and sulfuric acids and occasionally a wide variety of corrosive solutions containing both strong mineral acids and powerful organic solvents. Constructed in Hastelloy C with Teflon gears, this Pump has operated quite satisfactorily for years with Arapahoe only occasionally having to buy replacement parts.

This company is well known for their line of rare and specialty chemicals and synthetic compounds.

The fact that Eco precision, interchangeable parts are always available, in stock, for immediate air delivery, anywhere in the United States, makes possible the confidence with which many users of Eco pumps in remote locations continue to specify them on essential services.

ECO Products for Handling Corrosive and Hazardous Processing Fluids

ALL-CHEM® Rotary Pumps
MINILAB® Rotary Pumps
GEARCHEM® Gear Pumps
CENTRI-CHEM® Centrifugal Pumps
PUMPMOBILE® Portable Pumping Units
GEAR-VAC® Valves
CHEMICAL® DISPENSING VALVES
Factory Mutual Approved

Ask for literature on any or all of these ECO Products



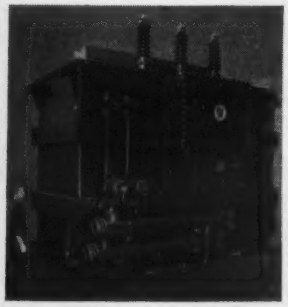
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release diaphragm air quickly. If this is not installed, air must bleed off slowly back through the three-way operative valve.

The second type commonly being used is a flanged ball valve with double Teflon seals on the ball. There is a distinct advantage in selecting the floating-ball type. Under pressure and heat, Teflon seals will flow. As a result, the floating ball has a way of pushing itself into the resin, permitting continuous seal.

Oven tests have shown that a ball valve subject to 1000°F with 60 psi of air on the upstream side takes approximately 20 minutes to fail after application of heat. For all practical purposes, this is adequate. ■



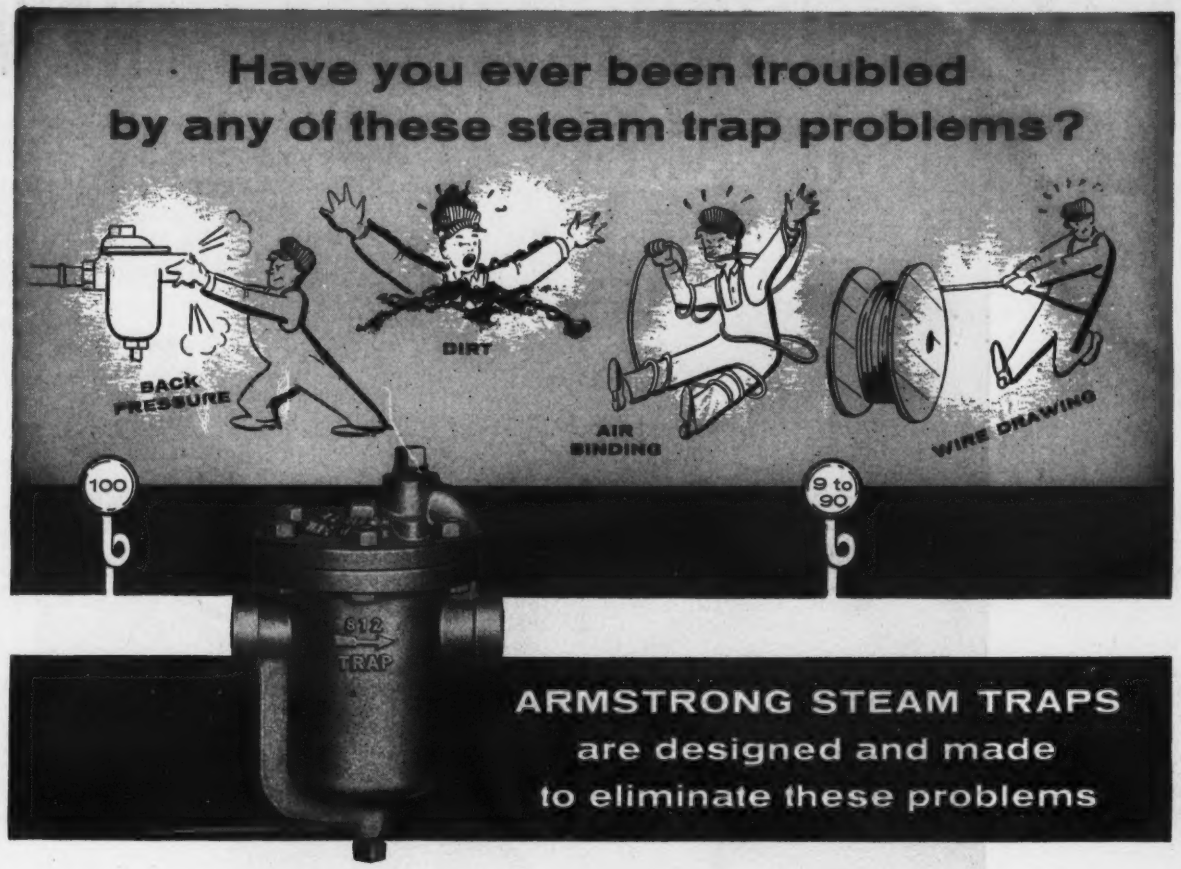
Power plus

. . . for a large southern chemical plant is represented by this three-phase 40,000-kva transformer.

This is believed to be the highest-capacity furnace transformer ever made. It is designed to provide 44,800 kva when operated at 65°C temperature rise, rather than at normal 55°C rise. It steps-down 44,000v to low voltages in range of 650 to 500v. Maximum line current is 42,000 amps.

(Transformer is product of Pennsylvania Transformer Div., McGraw-Edison Co., Box 330, Canonsburg, Pa.) Check 5855 opp. last page.

For more information on product at left, specify 5856 . . . see information request blank opposite last page.



BACK PRESSURE . . . Armstrong Traps operate on any back pressure—or vacuum, for that matter. As long as there is a pressure differential across the trap, it will close on steam and open for condensate. Even the high back pressure caused by blow through of one or more traps in the system will not disturb Armstrong Traps. Other than a reduction in capacity, Armstrong Traps are unaffected by back pressure.

DIRT . . . Armstrong Traps are not affected by ordinary dirt. When the trap opens condensate swirls down under the edge of the bucket and up through the discharge orifice. Dirt is kept in suspension and discharged along with the condensate. For very bad dirt conditions, Armstrong offers traps with integral strainers. These cost less than a trap plus a separate strainer.

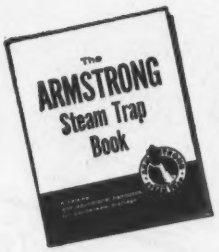
AIR BINDING . . . Armstrong Traps cannot air bind. Air in the system passes through a vent in the top of the bucket. It collects in the top of the trap and is discharged with the condensate. There is no chance for it to stop the trap. For low pressure on-and-off units where large amounts of air accumulate while the steam is off, Armstrong offers open float and thermostatic air vent traps in a complete range of sizes.

WIRE DRAWING . . . Armstrong Traps are designed and made to resist wire drawing. The valve and seat are tough stainless steel. The valve opens and closes tightly with a fast action and is always water sealed. There is virtually no chance for grit or sediment to lodge in the valve, virtually no chance to create conditions that lead to wire drawing.

There's no need to accept any of these problems as "inevitable." Your local Armstrong Representative can show you how to end them all. Call him today or write direct.



860 Series for low pressure heating service. 800 Series, side inlet, side outlet. No. 801, side inlet, bottom outlet. 880 Series, integral strainer. 200 Series, bottom inlet, top outlet. Forged Steel Series for high pressures, high temperatures.



The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS
8803 Maple Street, Three Rivers, Michigan
"See our catalog in Chemical Engineering Catalog"

Check 5857 opposite last page.

FALK INTRODUCES 2 NEW SERIES OF VERSATILE SPEED REDUCERS

Designed to serve industry's current and future requirements



Type YB
Right Angle Horizontal
(write for Bulletin 2100)

Type Y Parallel Shaft
(write for Bulletin 1100)

Parallel Shaft and Right Angle Horizontal Reducers cataloged thru 1,570,000 lb-in. torque at low speed shaft ...larger units upon request. Ratios 1.84 thru 292 to 1 for parallel shaft; 5.06 thru 1207 to 1 for right angle horizontal

These new units are probably the most thoroughly engineered speed reducers on the market today. Final designs based upon years of development study and a background of 50 years experience make these units as dependable as the name "FALK". A few of their many features are...

PINPOINT APPLICATION COVERAGE Wide choice of sizes and ratios permits the most economical selection of a correctly rated unit for each application. In each series of parallel shaft and right angle reducers, cataloged sizes range up to 1,570,000 lb-in. torque at the (11 inch dia.) low speed shaft. (Other standard designs to 25,000,000 lb-in. torque; custom designs for higher capacities.)

UNMATCHED VERSATILITY The "Basic Y" speed reducer design permits economical modification to meet a multitude of specific requirements. Smooth, flat surfaces simplify mounting of motor brackets, backstops, brakes, and any number of other accessories.

RUGGED HOUSINGS Sturdy housings not only provide maximum rigidity to maintain proper alignment of gearing, but also have the strength to support heavy overhung loads and withstand accidental blows.

DEPENDABLE FALK GEARING Gears are selected with the proper proportions and hardness to provide the optimum combination of maximum durability and strength for high shock as well as uniform loads.

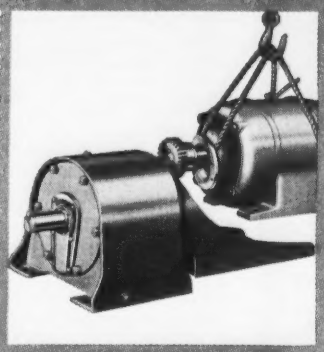
BEARINGS TO SUIT THE OVERHUNG LOAD Standard reducers can meet custom-built requirements with optional stock bearings and shafts (at only a nominal extra charge.) Maximum overhung load capacities are so great that for some conditions, still within the capacity of the reducer, extra strong supporting foundations and bolts must be provided.

DOUBLE GEAR LIFE Standard double ended shafts can be reversed end for end to bring into contact the unused surfaces of the gear teeth for twice the normal gear life.

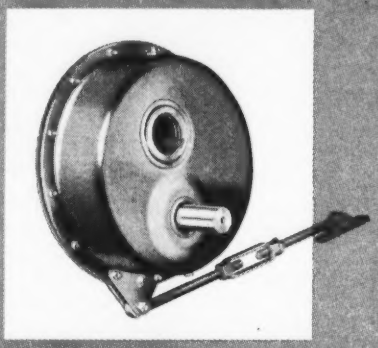
SEALS FOR ALL CONDITIONS Standard equipment oil seals assure oil-tight and dirt-free gear units for normal applications. Standard abrasive and moisture-resistant seals available upon order.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in most principal cities

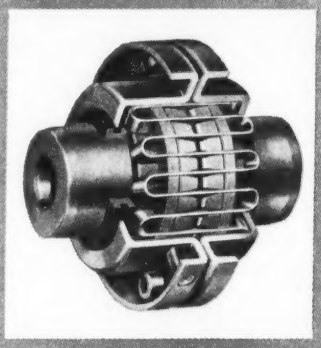
SOME OTHER MEMBERS OF AMERICA'S FIRST FAMILY OF POWER TRANSMISSION PRODUCTS



ALL-MOTOR MOTOREDUCERS



SHAFT MOUNTED DRIVES



STEELFLEX COUPLINGS

FALK

A GOOD NAME IN INDUSTRY

FALK, ALL-MOTOR, and STEELFLEX are registered trademarks

For more information on product at left, specify 5858 see information request blank opposite last page.

ONE OF A SERIES OF CHATS ABOUT THE CONSERVATION AND CONTROL OF HEAT

SARCO TOPICS

WHY THE BIG STRAIN?

It's tough to keep gases and liquids "clean" as they run through a pipe. They drag impurities along, which can make even plain water a trouble maker, let alone more sophisticated fluids. That's because water, as a liquid or steam, is intimately involved with vital equipment like steam traps, temperature regulators, or tools. Meters, burners, nozzles, and pumps, too.

By this time you must realize we're going to talk strainers, don't you? A good, stout subject, of interest to all who feel production belongs up and costs belong down. Sarco makes strainers for water and condensate, steam, oil, air, gas and other piped fluids . . . dozens of different sizes and types and ratings of strainers to match every application need. Even our line of plain and simple strainers is built for super service. These are pipeline strainers, types AT, BT, and CT, which are designed for 250, 250 and 600 psi non shock, respectively, and 475°, 450° and 750°F. temperature ratings. Standard screens are heavy-gauge, perforated brass or stainless steel. Sarco specializes in screens that can withstand abnormal pressure differentials created by accumulated sediment.

Next, Sarco's flanged strainers, type D. These come in larger sizes, right up to 12", and are available in standard or extra heavy types.

And finally, *Sarco scraper strainers*, manual or motorized. These are the really eye-popping models, and if you can't use one yourself — well — you'll just have to get your kicks elsewhere.

Examples? Take Inland Steel Company at East Chicago, which gets water from Lake Michigan to cool its large air conditioner condensers. The water used to pass through traveling screens, but still contained fine sand. Clogging!

Heat under collars! Frequent cleaning required! Sometimes practically no air conditioning on hot days. (Isn't that always the way?)

The Inland Steel people installed Sarco Rotary Scraper Strainers, Type VRS, which incorporate a hand-operated helical scraper knife within the cylindrical strainer screen. A few turns of the crank at regular intervals, and the sand is scraped off the screen, blown clear, and discharged at pressure through a manual valve to waste. Dismantle the strainer? Shut down the unit? Not *this* strainer!

Now, as long as we've come this far, it's only a hop and a skip to the Firestone Tire and Rubber Co. in Akron, Ohio, who also use water in tremendous quantities. They circulate it through tire presses and a cooling tower, and there's no nonsense about it. It *has* to be clean or damage to equipment could be downright catastrophic. When the plant



modernized and enlarged, Firestone replaced their 4" Sarco hand-operated scraper strainer, type VRS, with a larger Sarco 8" model. And while they were about it, they got the motor-operated type, for continuous cleaning.

When we say that companies like these want the insurance of a Sarco strainer, it sounds like advertisingese, but sometimes there just isn't any other way to put it. Sarco strainers *are* insurance at low cost on the operation of your high cost equipment. So when we ask if you have lumps in your pumps, or worries over your slurries, we're *serious*. We've heard everything in the straining line, so why not write us for literature and answers to those special problems you have.

A T-44 IS THE BEST POLICY

Sorry, but we can't leave the subject of insurance without bringing to your attention one of the best little insurance policies any company requiring cooling control could invest in. It's the *self-powered* Sarco T-44 Automatic Cooling Control. No compressed air or electricity is needed, but its advantages are best described in terms of three different plants of just one Sarco customer — Revere Copper and Brass, Inc.

Revere-Baltimore, Md., has cut water use 40 to 50% with T-44's. But in addition to former water waste, Revere had even more problems: possible wet air from uncontrolled cooling of compressor aftercoolers, plus sweating compressor cylinders; variations in viscosity of hydraulic oil and bearing oil; gas generator water waste; unreliability of manual shut-off of water supply when machines were down.



If your ears perk up in sympathy at mention of any of these problems, the results of Revere's cooling control program should bring you to full attention. One large compressor that had gulped 2400 gallons per hour now takes only 420 gallon sips. In addition all the problems itemized above were solved. T-44's are now used on their air compressors, gas generators, and hydraulic oil systems. At Revere-Riverside, Cal., water savings of 50% were experienced, and at Revere-Rome, N.Y., substantial savings were made too.

But after all, wasting water is only one way of wasting money, so let's go on to another matter of interest: the evils of manual control. When cooling water is controlled by hand the temptation to leave the valve nearly wide open is almost overpowering, in order to play it safe if the load varies. Result: overcooling, of course. And varying the flow runs the risk of undercooling. In either case, lowered process efficiency. Answer: The automatic Sarco T-44, which can't be tempted, is meticulously honest, unsentimental, and plain inhumanly practical when it comes to cooling control. You really ought to write for literature. T-44 is your best policy.

SPARE PARTS INSURANCE

As long as we're near the end, and still on this subject of insurance, may we graciously leave you with this valuable tip? No matter how closely a steam trap approaches perfection, some gremlin may cause it to act up. It's conceivable. So, keep on hand a parts list and spares of key parts for your steam traps and other system components. Parts are small and worth their weight in gold when you need them. A Sarco field engineer will make up a suggested list for you, if you tell us what components make up your system.

Might as well even keep a disc or two on hand for your Sarco Thermo-Dynamic Steam Traps, Type TD-50, even though they're so trouble-free our salesmen keep complaining about the lack of replacement parts business. We'll be glad to tell you about this unique steam trap in case you still don't know how miraculously simple and effective it is.

Pardon our monopolizing the conversation in this series of paid communiques, but we're trying our best to interest you in certain subjects that concern us both — to the point where you'll communicate.

5903

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.

STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

Check 5859 opposite last page.

ENGINEERING & SAFETY

▶ A NEW SOLUTIONS ARTICLE

Insulation-installation tab pared by 30%

By switching to a new type of polyester-foam insulating material for chemical-storage tanks and processing equipment, a midwest chemical manufacturer has achieved a saving of about 30% in installed costs.

In addition, the company reports that the new material loses virtually none of its insulating properties during use. This is because it does not absorb or store-up moisture.

Material is supplied in 4 x 12′ sheets, laminated to a 15-gage vinyl skin. A major advantage of the material is that it is easy to handle and install. One sheet weighs 12½ lb.

The insulation is applied under pressure to surfaces of tanks and equipment with mastic cement. The vinyl skin on each sheet of the material has a two-inch overlay which



Vinyl skin on polyester-foam insulating material provides smooth water-repellant surface which requires little or no maintenance

increases its water-tightness. Joints are sealed with adhesive polyethylene tape. Total installation time for a 10′-diam tank which is 20′ high is roughly two days. No skilled labor is required.

Polyester-foam insulation can be used for surface temperatures in 50 to 250°F range. Its insulating properties are approximately the same as those of comparable materials. The K factor of the material

is 0.25 at 32°F, 0.38 at 250°F. After having field-tested this insulation for more than one year at one plant, the chemical company is now beginning to use the material at other locations.

(Curon polyester foam is product of Reeves Brothers, Inc., 1071 Avenue of the Americas, New York 18, N.Y.)

Check 5860 opposite last page.

Portable drafting tool folds to pocket-size

Uses: Portable drawing equipment for field sketching and on-spot drawing to scale.

Features: With standard pad, provides complete drafting facilities anywhere, anytime. When folded in its carrying case, tool is pocket-size.

Description: Main scale slides to provide parallel horizontal lines, while spring-loaded angle arm can be snapped into position of 30-45-60-90-120-135-150° either above or below horizontal. Instrument is constructed of high-strength, color-tinted polystyrene.

(Polyangle is development of Country Engineering, Inc., 20 Blueberry Lane, Darien, Conn.)

Check 5861 opposite last page.

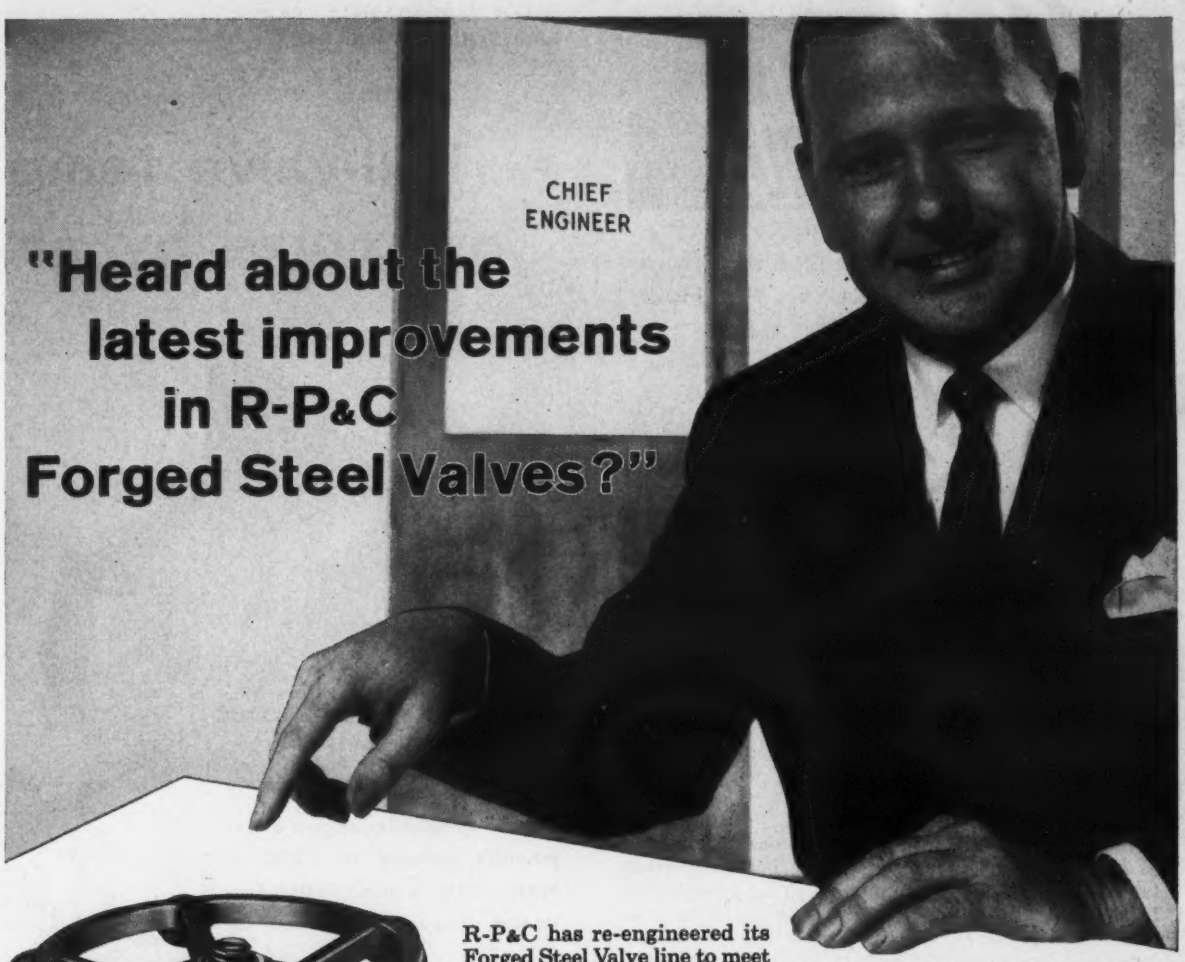
High-heat role played by fiber-glass cloth tape

A fiber-glass cloth electrical tape has been developed for maintenance, splicing, sealing, and insulating where components are exposed to high heat. It is used to insulate and splice appliance wiring, Class-B insulation in motors and generators, sealing hot air ducts and fire walls.

Tape has glass-cloth backing with rubber-base pressure-sensitive thermosetting adhesive. It does not contain sulfur. The seven-mil-thick, tape has tensile strength of over 100 lb/in width.

(Fiber-glass-cloth electrical tape 21B is product of Permacel, New Brunswick, N.J.)

Check 5862 opposite last page.



"Heard about the latest improvements in R-P&C Forged Steel Valves?"



R-P&C has re-engineered its Forged Steel Valve line to meet the highest standards of quality for the Refinery, Chemical, Power and Process industries. These valves incorporate the most up-to-date design and material improvements found in any forged steel valve! One example is the stuffing box—redesigned for 50% greater sealing efficiency. These improvements add up to longer, trouble-free valve service for you, with minimum maintenance.

Here are other R-P&C Forged Steel Valve improvements:

- **Stellite-faced seats, lapped to 2-3 micro-inch finish; results in a durable seal**
- **Redesigned body bonnet joint gives 25% increase in gasket sealing area**
- **"390 Brinell" stem with rolled threads for continuously smooth movement**
- **Moly-Disulphide lubricated oil grooves in operating nut give easiest operation**
- **1200°F premium packing—uniformly compressed and graphited —includes a proved inhibitor that prevents corrosive damage**
- **Thrust washer between handwheel and operating nut eliminates seizing and galling**

In addition to Forged Steel Gate and/or Globe Valves, R-P&C distributors offer users in all industries a complete line of R-P&C gate, globe and angle valves in all standard materials: iron, bronze, bar stock, cast steel—plus many specialties.

See your R-P&C distributor for full details and prompt service.

R-P&C VALVES

ACCO

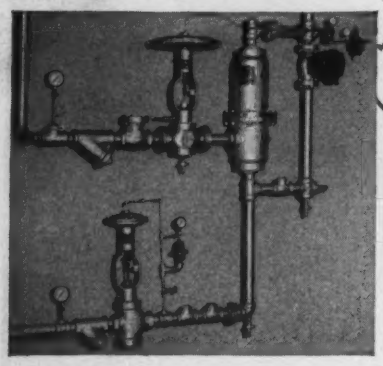
R-P&C Valve Division, American Chain & Cable Company, Inc.

Reading, Pa., Atlanta, Boston, Chicago (Melrose Park), Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Check 5863 opposite last page.

HOT WATER INSTANTLY

**Accurate Temperatures . . .
Low Cost . . . Any Quantity from
500 to 50,000 Gallons Per Hour!**



Pick
STEAM INJECTION

WATER HEATERS

for high or low pressure steam

Direct contact of steam and water in the Pick patented mixing chamber produces hot water at the desired temperature, and in the required quantity, *instantly!* There's no time lag . . . no steam wasted to maintain heat in stored water . . . steam used only as hot water is drawn. Water temperature maintained within 3° plus or minus. Volume adjustable from 5% to full rated capacity. Pick heaters require no floor space . . . usually installed on wall. Whatever your hot water needs are, Pick will do it faster, more accurately and at lower cost!

FREE CATALOG — Contains complete information and specifications. Write today to Dept. 3.

Pick WATER HEATERS

PICK Manufacturing Co.
Water Heater Division
WEST BEND, WISCONSIN

Used by America's Leading Industries:



U. S. Steel, Gary, Indiana
Continuous annealing line

Bates Mfg. Co., Lewiston, Maine
Finishing Process of Bedspreads

General Aniline & Film Corp.
Linden, New Jersey
Filter press washing

Gerber Products Co.
Fremont, Michigan
Sterilizing, washing & processing

Check 5864 opposite last page.

Ball-valve temp barrier overcome by new design



Use of graphitic-carbon seats permits service to 1000°F, surpassing former Teflon-imposed temperature limit by 400°F

TEMPERATURE LIMITATION — long a bugaboo to ball-valve makers—has been pushed upward with the introduction of a clever design incorporating graphitic-carbon seats.

The new ball valve may be used on non-oxidizing liquids or gases at temperatures as high as 1000°F, and with oxidizing reagents up to 700°F. Heretofore, ball valves had been suitable for applications only to about 600°F (using a reinforced Teflon seat with a metal containing ring).

Ironically, Teflon (and similar materials), which made the whole ball-valve revolution possible in the first place, imposed on the valve its only major limitation—that of higher temperatures. (See "'Cinderella' ball valves strike it rich in CPI," Aug. 1961 CP, p. 34.)

The graphitic carbon used in the seats is Graphitar, a product of the U.S. Graphite Co. Use of the material was made possible by a design in which a spring forces the ball downward into a wedge-seat arrangement (see photo). This approach gives a tight closure, even as the seats wear down.

Allowable maximum pressure at higher temperatures is, of course, dependent upon valve-body materials. At 1000°F, for example, bodies of Type-316 stainless steel with a 300-psi ASA rating are suitable for pressures to 355 psig, while carbon-steel bodies are good to 80 psig.

The ball valves are available with screwed and socket-weld end connections in one- through three-inch sizes, and with 150- or 300-psi ASA flanged ends in one- through eight-inch sizes, in either manually or pneumatically operated versions.

(Graphitar-seat ball valves are product of Hills-McCanna Company, 400 Maple Ave., Carpentersville, Ill.)

Check 5865 opposite last page.



Coppus Horizontal Steam Turbine

NEW RUGGED DESIGN—BLUE RIBBON RELIABILITY!
Here's a new dimension in turbine performance! Coppus brings you a new rugged stability of design . . . a new measure of reliability in a complete range of power-packed turbines, from 1 HP to 250 HP — marked with the Blue Ribbon only after each is precision made . . . precision tested. Performance features like these assure you Blue Ribbon Reliability —

A totally enclosed governor . . . totally enclosed, independently operated safety trip . . . easily replaceable packing and bearings . . . multiple steam nozzle control . . . brake rim for added safety . . . wide bucket "L" type wheel (optional) for minimum water rate.

Coppus Turbines are built to customers' specifications, including API and NEMA standards. All Coppus Products carry the same Blue Ribbon assurance of reliable performance. For further facts on turbines, send for new Catalog 200. COPPUS ENGINEERING CORPORATION, 389 Park Avenue, Worcester, Mass. Sales Offices in *Thomas' Register*.

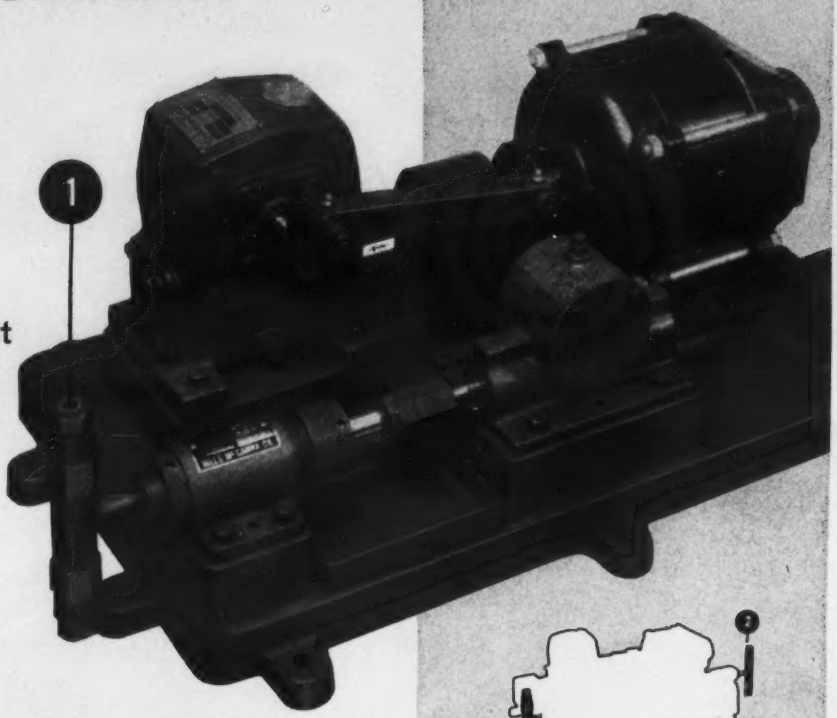
COPPUS
STEAM TURBINES

Check 5866 opposite last page.

HILLS-McCANNA

Add-on Metering Pumps

let you buy only what you need today...add to it tomorrow if your requirements change

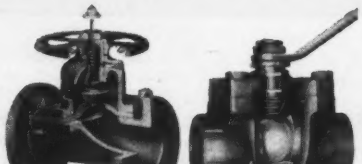


When you buy a Hills-McCanna metering pump, you are buying appreciable built-in protection against obsolescence caused by changing process requirements.

Add-on construction makes it possible to modify pumps already in the field. Feeds can be added as illustrated. Optional micrometer screw stroke adjustments to permit change in feed rate while the pump is operating can be installed. Standard heads can be replaced with jacketed liquid ends for pumping materials requiring refrigeration or heat. Diaphragm liquid ends can be supplied to replace plunger-type liquid ends. All-plastic liquid ends (Penton or PVC) can be supplied. Automatic controls can be added. Variable speed arrangements are available.

No matter what your chemical metering or proportioning application, you'll be money and satisfaction ahead with versatile, reliable Hills-McCanna pumps. The line is complete—capacities from 0.10 to 980 gph, pressures to 30,000 psi.

For specific recommendations, write today for literature, outlining your particular requirements.



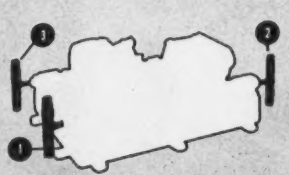
Hills-McCanna also manufactures a complete line of diaphragm valves 1/2"-16"; ball valves 1/4"-12"; and magnesium alloy castings.

HILLS-McCANNA COMPANY

400 MAPLE AVENUE • CARPENTERSVILLE, ILLINOIS

Hills-McCanna Model "U" pump, single feed

. . . a second feed can be added to a pump with a two-feed base



. . . or a second, third, or fourth feed can be added to a pump by using a four-feed base





Optional micrometer screw stroke adjustment can be added at any time

Check 5867 opposite last page.

Safety Slants



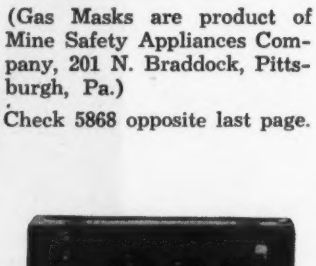
Seamless canisters,

. . . a new harness design, and a rugged plastic case that is chemically inert and resistant to moisture, are among features of a line gas-masks just introduced.

Every canister is equipped with toxic dust filter which permits its use in atmospheres containing both gaseous and particulate contaminants. This special filter provides application flexibility and reduces number of types of canisters necessary to provide protection against gaseous and toxic aerosols.

(Gas Masks are product of Mine Safety Appliances Company, 201 N. Braddock, Pittsburgh, Pa.)

Check 5868 opposite last page.



Breath of air

. . . for asphyxiation victims is available in form of this resuscitator-inhalator-aspirator.

It includes the innovation of an assembly for administering oxygen to the semi-conscious patient requiring enriched ox-

ygen concentration, but not resuscitation. The entire operating unit pops out of the case to reach an accident victim in cramped quarters.

All accessories are located in the cover of the case in snap-holders. The entire unit with full cylinder weighs 28 lb.

(E & J Mercury Mark I is further detailed in Cat Sheet 2490-C — Ohio Chemical & Surgical Equipment Co., Division of Air Reduction Company, Incorporated, 1400 E. Washington Avenue, Madison 10, Wisconsin.)

Check 5869 opposite last page.

Triple-threat status

. . . is being claimed for multipurpose dry chemical extinguishing agent, first to be offered in complete line in portable extinguishers and cartridge-type extinguishers. Agent is effective on Class A, B and C fires.

Underwriters' laboratories ratings per lb of extinguishing agent are highest given to an ABC dry chemical. Model numbers are same in both cartridge and stored-pressure-type units. Model 10 contains 8½ lb of chemical; Model 20, 17 lb; and Model 30, 25 lb.

(Foray dry chemical extinquishing agent is being introduced by Ansul Chemical Company, Marinette, Wis.)

Check 5870 opposite last page.

Hydrocyanic acid, its properties and recommended safe-handling and use practices, are covered in latest of series of chemical-safety data sheets. This revised edition details engineering control of health, fire and explosion hazards of the chemical and discusses employee safety education and training and personal protective equipment recommended.

Pamphlet differs from others in that it contains information of valves and pipe for use in HCN service; on storage, including transfer of HCN from tank car to storage tank; and on procedures in time of emergency. Copies of Pamphlet SD-67 are available at 30c each from Manufacturing Chemists' Association Inc., 1825 Connecticut Ave., N.W., Washington 9, D.C.

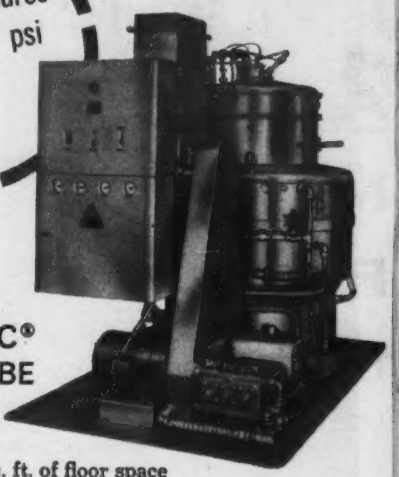
when you need . . .

- HIGH-PRESSURE STEAM
- SUPER-HEATED STEAM
- HIGH TEMPERATURE WITHOUT PRESSURE . . .

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HAS THE ANSWER!

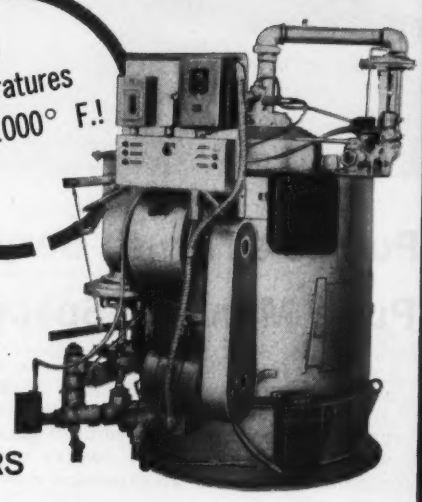
steam pressures to 900 psi or higher!



VAPOR MODULĀTIC® WATER-TUBE BOILERS

- Compact—40 sq. ft. of floor space
- Fully automatic operation
- Completely packaged, fully wired
- 18 to 150 hp
- Ideal for multiple-unit installations

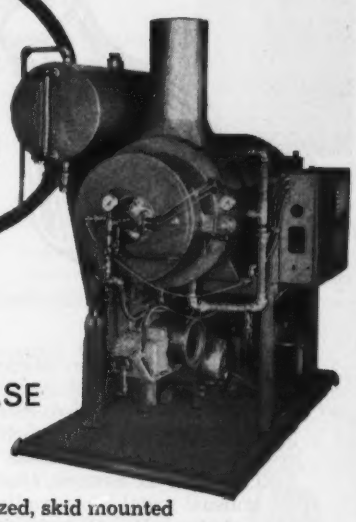
steam temperatures 600° to 1000° F.!



VAPOR STEAM SUPER-HEATERS

- Compact—16 sq. ft. of floor space
- Automatic operation
- Meets ASME and other codes
- Constant temperature control
- Completely assembled and wired

600° temperatures without pressure!



VAPOR HI-R-TEMP* LIQUID PHASE HEATER

- Completely unitized, skid mounted
- Accurate, automatic temperature controls
- Eliminates need for water treatment
- Low-pressure vessels and flow circuits
- Sizes to 13,000,000 b.t.u.

*T.M.

Send coupon today for complete information

VAPOR HEATING CORPORATION, Dept. 3-I
80 East Jackson Boulevard, Chicago 4, Illinois.

Please send additional information on your:

☐ Modulātic Water-Tube Boilers

☐ Steam Superheaters

☐ Hi-R-Temp Liquid Phase Heaters

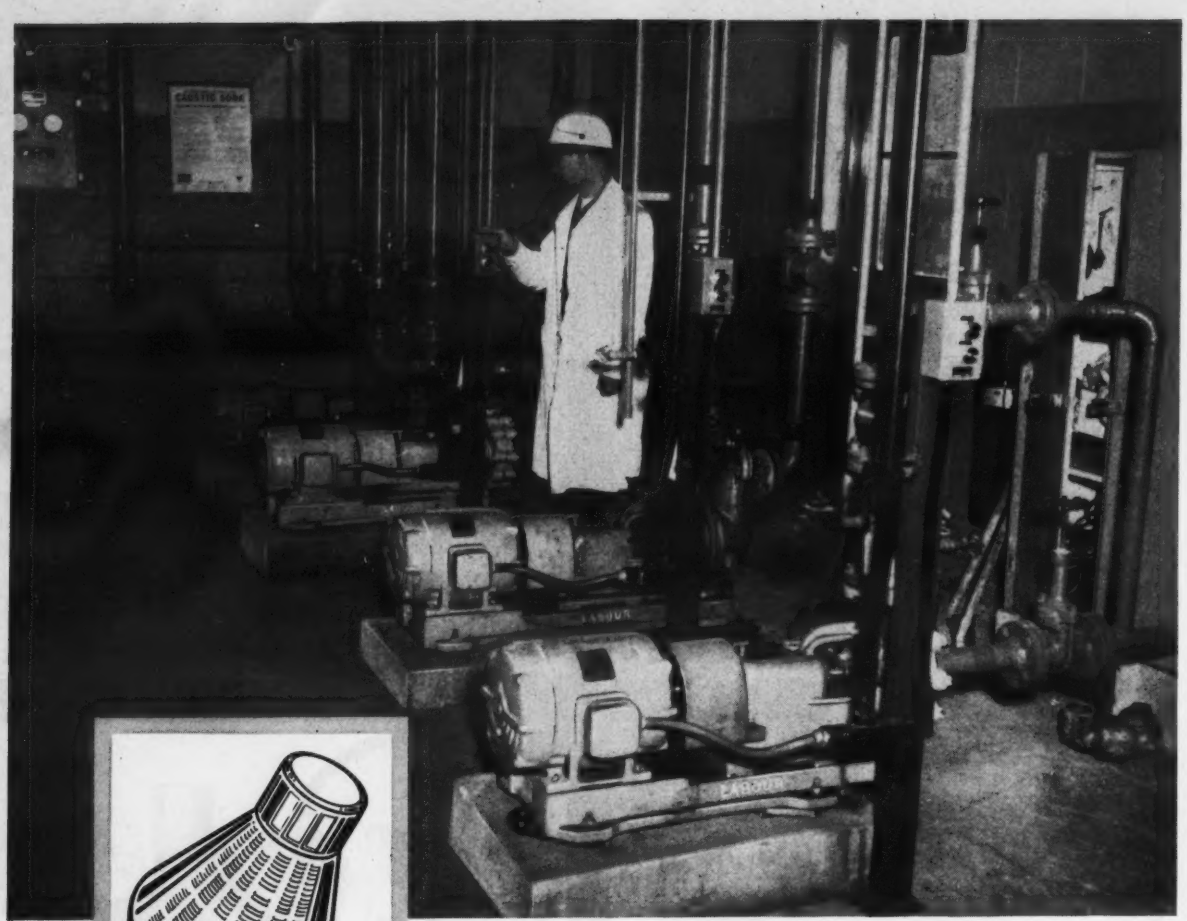
NAME_____

COMPANY_____

ADDRESS_____

CITY, ZONE, STATE_____

Check 5871 opposite last page.



LaBour Pumps at Brush Beryllium Help to Put a Man into Space

When Commander Shepard made his historic flight to the edge of space he was protected from the intense heat of re-entry by a solid shield of beryllium, the light weight, heat resistant metal produced and fabricated by Brush Beryllium Company at Elmore, Ohio. The refining of this unusual metal is a complicated chemical process, and Brush Beryllium depends on LaBour pumps throughout for handling corrosive liquids of various kinds.

Some of the LaBour Pumps at Elmore have been operating for ten years. Many more are past four years of service, and all are on an around-the-clock, seven-day-week basis. Little or no service troubles have been encountered, which explains why the twelve new pumps recently installed in an expansion move are also LaBours.

Perhaps *your* liquid moving problem isn't as glamorous — or as difficult — as that at Brush Beryllium Co. Maybe it's even more so. Either way, it will pay you to investigate how you can save money and headaches by specifying LaBour pumps to do your toughest jobs.

ORIGINAL MANUFACTURERS OF THE SELF PRIMING CENTRIFUGAL PUMP

LABOUR

THE LaBOUR COMPANY, INC. • ELKHART, INDIANA
WHITE PIGEON, MICH. • LONDON, ENGLAND

Check 5872 opposite last page.

Precision coating possible with improved control for plasma spray

Uses: Control and flow of plasma powders.

Features: Three-component systems includes: console, with automatic controls, including fail-safe devices; powder feeder that permits exact duplication of coatings; simplified spray gun with one-piece nozzle and all-purpose electrode.

Description: Flame spray speeds are possible with most



Flame spray gun has no moving part, requires no adjustments

materials, of 5 to 15 lb/hr with deposit efficiency of 65 to 80%.

Simplified gun, weighing 3¼ lb, can be operated by hand or machine mounted, and is small enough for spraying internal bores down to 5" ID. Nitrogen, argon or helium can be used as plasma gas. Tap water, at ordinary pressure, serves as coolant.

(2M plasma flame spray system is development of Metco Inc., 1101 Prospect Ave., Westbury, L.I., N.Y.)

Check 5873 opposite last page.

Steam - jet blowers and blast nozzles are considered in eight-page bulletin, listing dimensions, weights and capacities for all sizes. Bul 4AB—Schutte and Koerting Company.

Check 5874 opposite last page.

NEW LITERATURE
Plant Engineering, Safety and Fluids Handling

Popular colors, used for coding inventory stocks and work in process, identifying piping, electrical connections, fire and water valves, and inter-plant routing of materials, are exhibited on Color Card — Reynolds Ink, Inc.

Check 5875 opposite last page.

Step-by-step description of design and construction of two-drum water tube packaged boiler for oil or gas firing is accompanied by full-color cutaway views in Cat SB63—Erie City Iron Works.

Check 5876 opposite last page.

Friction's effect in threaded connections and how solid lubricants provide more uniform bolt tension at lower torque readings, and eliminates galling and seizing is covered in eight-page Special Print 456 — The Alpha-Molykote Corporation.

Check 5877 opposite last page.

Helping engineers to select right flexible metal hose for specific installations is purpose of data compiled in 32-page illustrated Cat 600 — Atlantic Metal Hose Co., Inc.

Check 5878 opposite last page.

Roof ventilators, including a reversible model which can be converted from exhaust to intake at a flick of a switch, are detailed along with specifications, dimensions and performance data in Bul A-112E — Hartzell Propeller Fan Company.

Check 5879 opposite last page.

Pipe fittings, fabricated of stainless steel for service from 150 to 6000 psi, are summarized with drawings and tables in 36-page Fittings Cat — Valve & Fitting Division, Cooper Alloy Corporation.

Check 5880 opposite last page.

Centralized lubrication equipment available is summarized and automatic, semi-automatic and manual methods of operation described in 32-page Cat 82—Lincoln Engineering Company, division of The McNeil Machine & Engineering Company.

Check 5881 opposite last page.

Wrenches and hand tools are taken up in 128-page catalog covering such devices as manual and hydraulic gear pullers, electric drills, sanders, grinders and others. Wrench and Tool Cat — Snap-on Tools Corporation.

Check 5882 opposite last page.

Data on pipe friction is updated in 90-page book which includes tables of resistance coefficients for valves and fittings, 90° bends, diffusers, and others; charts showing friction loss for incompressable flow of viscous fluids for pipe sizes from ½ through 12"; fold-in charts of friction factors with related data to permit calculation of friction loss for any fluid in any size or shape of conduit. Pipe Friction Manual may be obtained for $2.00 from the The Hydraulic Institute, 122 E. 42nd St., New York 17, N.Y.

Gate valves, globe and angle, and check valves are among those illustrated in 16-page Cat 10-B — R-P&C Valve Division, American Chain & Cable Company, Inc.

Check 5883 opposite last page.

Flexible pipe connectors, their application, design and handling are delineated in 16-page magazine-article reprint. Illustrations are photos of actual applications; also included are tables, drawings and series of "do's and don'ts." Manual AM-9 — Allied Metal Hose Co.

Check 5884 opposite last page.

Ball-valve line is presented in 16-page catalog, illustrated by cutaway drawings and phantom and exploded views . . . and including materials - of - construction charts, pressure-temperature curves and dimension tables. Flo-Ball Valve Cat—Hydromatics, Inc.

Check 5885 opposite last page.

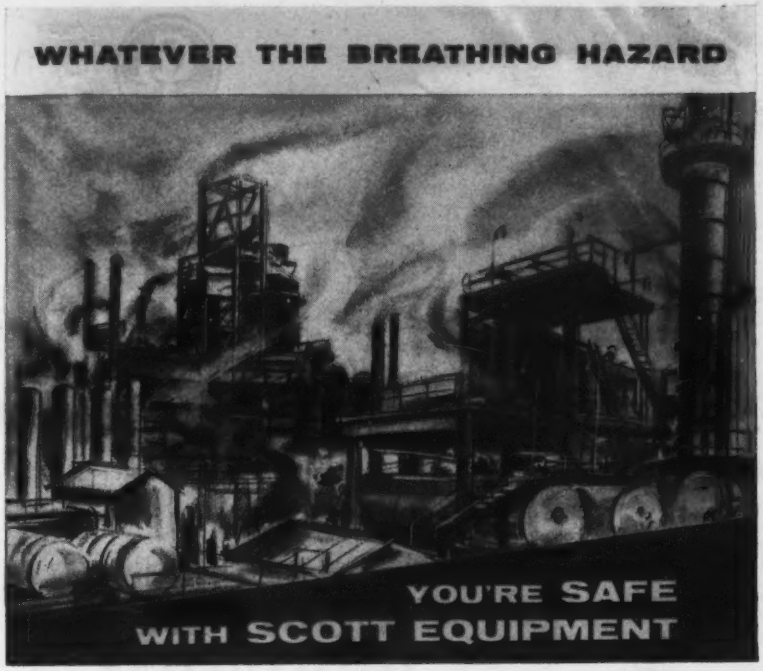
Flexible-cushion couplings which absorb vibration and compensate for all combinations of shaft misalignment and end float are topic of 24-page bulletin, including drawings and installation photos. Bul 901B—Dodge Manufacturing Corporation.

Check 5886 opposite last page.

Industrial-gloves selection for handling nearly 400 different chemicals is information included in eight-page catalog incorporating performance chart rating comparative wear and chemical resistance of Neoprene, Neoprene-coated, Koroseal-coated, and rubber gloves. Industrial Gloves Bul —B.F. Goodrich Industrial Products Company, Division of B.F. Goodrich Company.

Check 5887 opposite last page.

"Techniques of Plant Maintenance and Engineering", verbatim report of 1961 Plant Maintenance & Engineering Conference contains texts of 37 papers, 114 charts, diagrams and tables, and discussions of 607 questions posed by audience. Copies of 349-page book are $10.00 each, postpaid, from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y.



Scott Sling-Pak Model 6000-B4A

When seconds count, reach for the Scott Sling-Pak. This model is the fastest piece of emergency equipment made. Ideal for fast, safe entrance into hazardous atmospheres. Cylinder holds enough pure breathing air for 15 minutes of hard work. Breathing protection at lowest cost.



Scott Air-Pak Model 6000-A2MS



For dangerous jobs of longer duration. Safe, comfortable breathing protection for a minimum of 30 minutes at extreme exertion. Bureau of Mines Approval No. 1308.

Scott Demand Respirators

Designed especially to provide breathing protection in atmospheres not immediately dangerous to life and from which the wearer can escape without breathing equipment. Cylinder models and plant air-supply models available. Bureau of Mines Approval No. 1924.



Scottoramic Mask



Provides picture-window vision in all directions for greater safety.

Missiles and Space Vehicles

Military and civilian installations throughout the world, handling exotic fuels and chemicals, are depending on Scott Protective Breathing Equipment to solve their respiratory problems.

SINCE 1932 Scott

SCOTT AVIATION CORPORATION
242 ERIE STREET • LANCASTER, N. Y.
Canada: Safety Supply Co., Toronto — Branches in Principal Cities
Export: Southern Oxygen Co., 3 West 57th Street, New York 19, N. Y.

Check 5888 opposite last page.

experience and attention to detail

...your assurance of

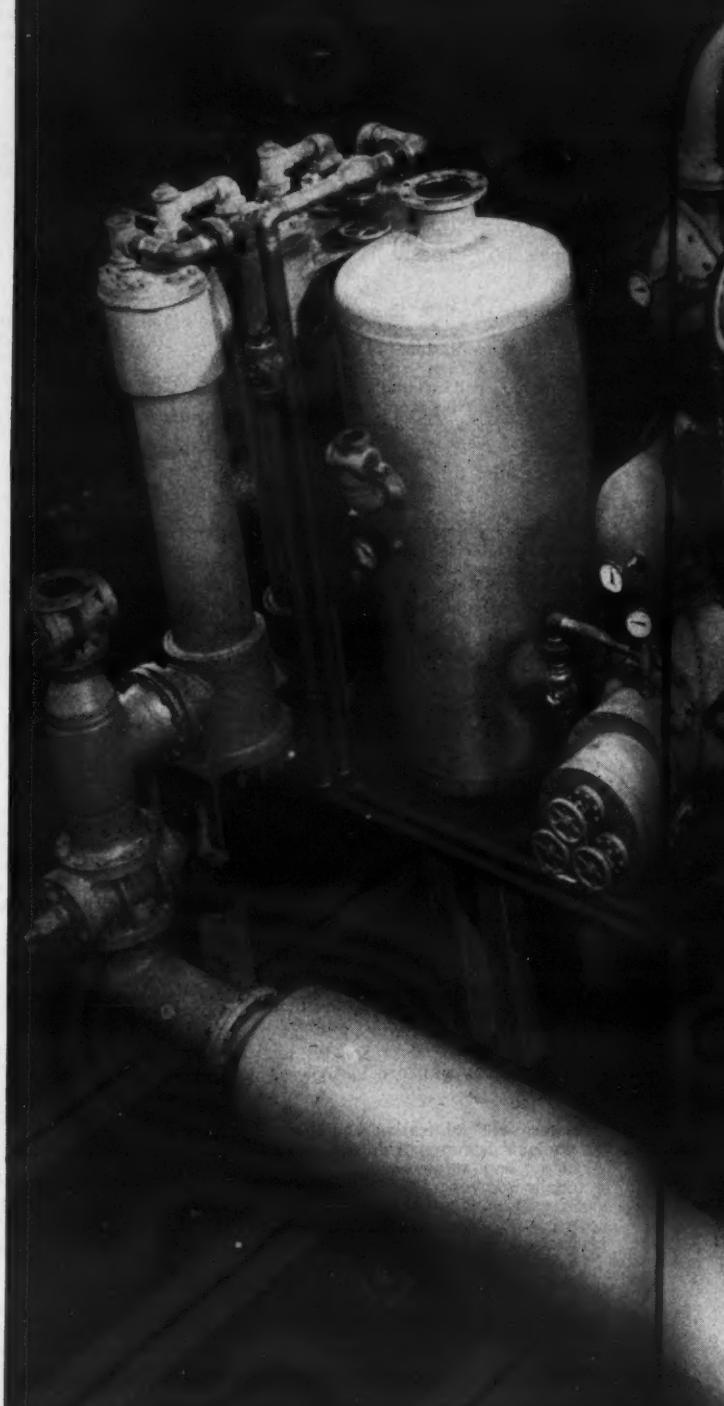
PROCESS COMPRESSOR PERFORMANCE

There's a CP Compressor exactly right for your needs, evolved from 60 years of experience in design and manufacture. Take the Class FE horizontal, balanced-opposed machine for example . . . you have a choice of many crankthrows, cylinder arrangements and staging that will give you the perfect compressor for any process requirement.

Other CP Compressors from 7½ to 5,000 hp. For vacuum service and for pressures to 15,000 psig. . . . motor or steam drive.



Class FE-44 horizontal, balanced-opposed, 4-stage compressor, in liquifaction service.

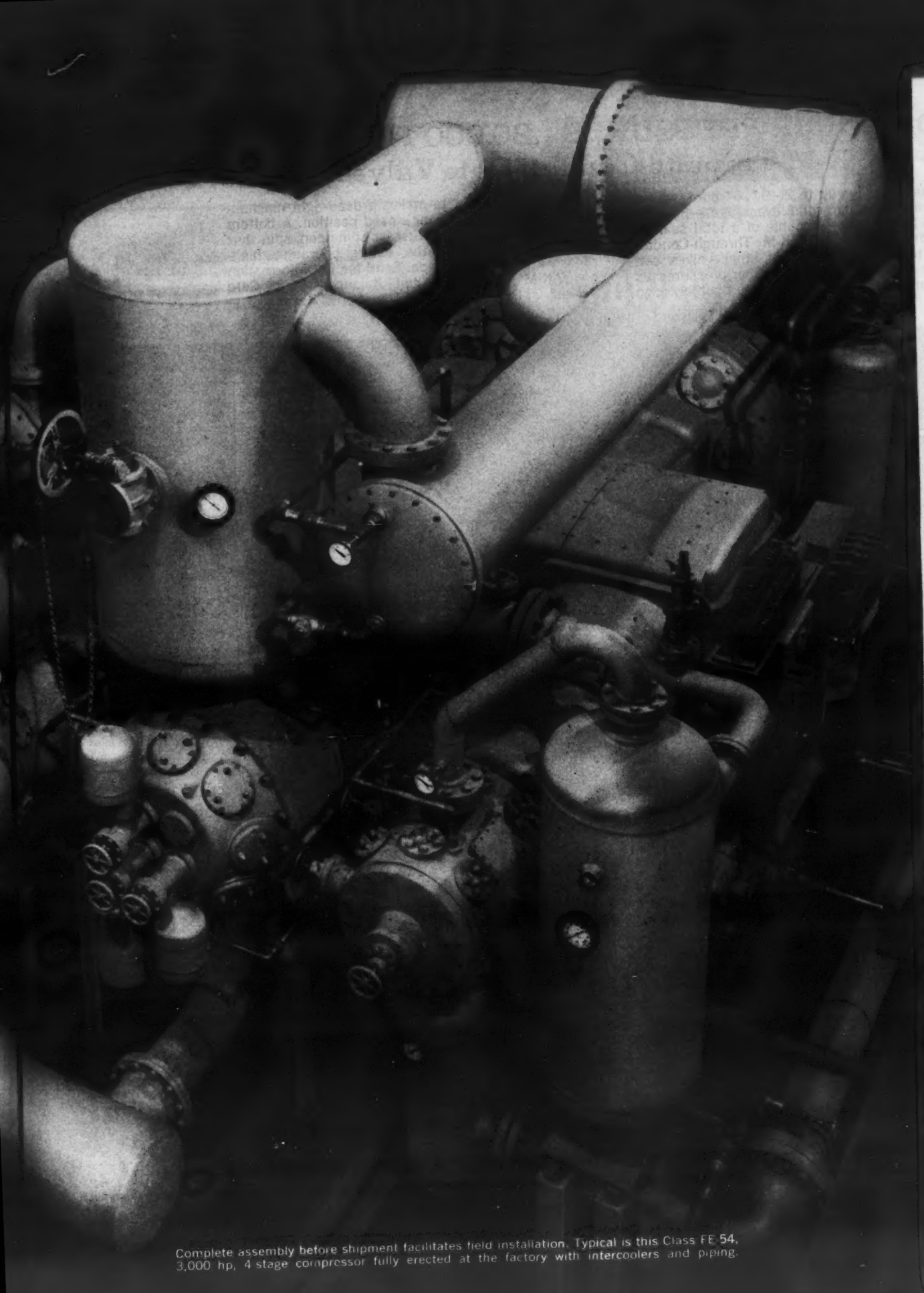


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For more information on product at right, specify 5889 . . . see information request blank opposite last page.

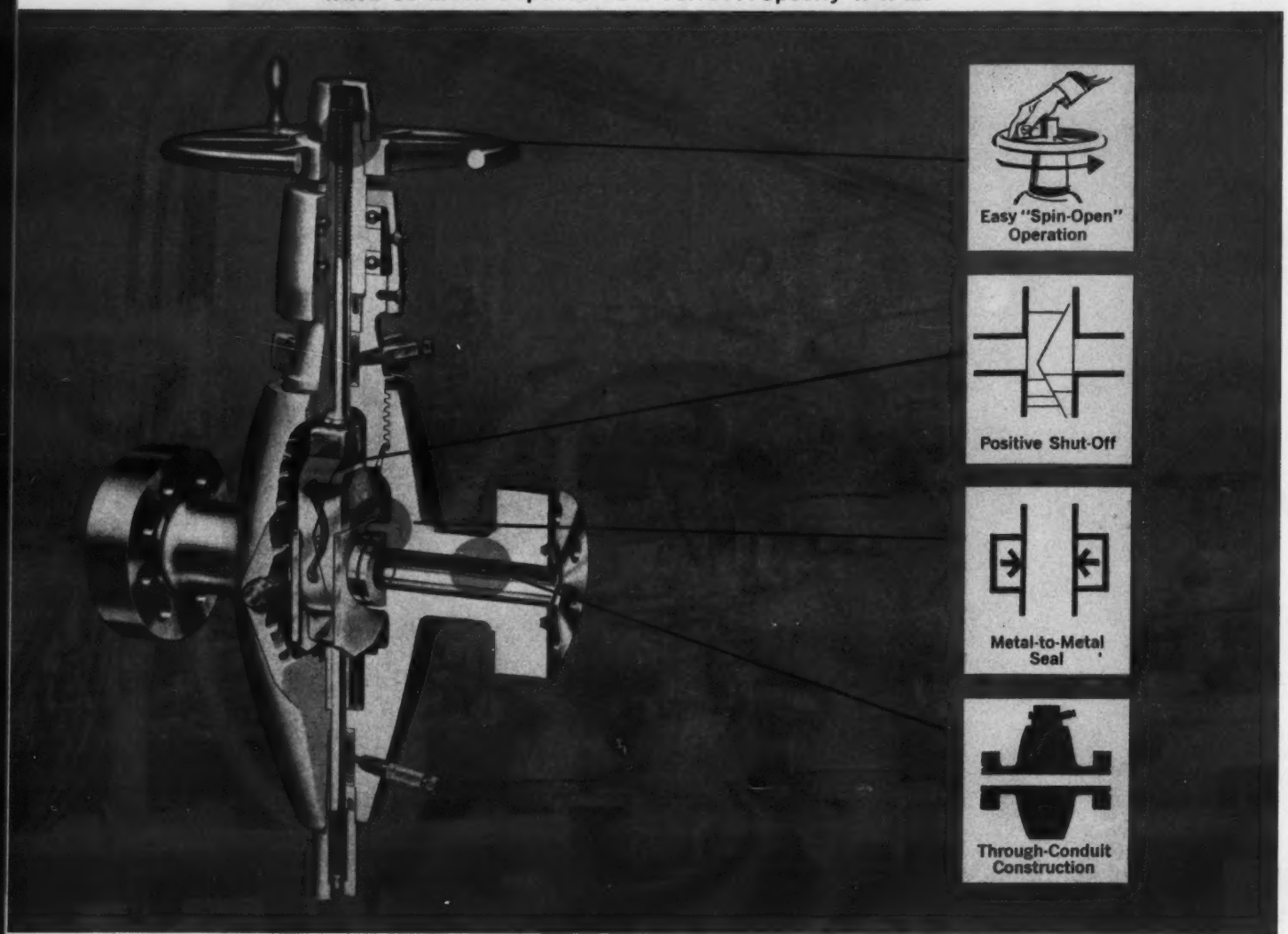


Complete assembly before shipment facilitates field installation. Typical is this Class FE 54, 3,000 hp, 4 stage compressor fully erected at the factory with intercoolers and piping.

FOR SUPER-PRESSURES...20,000 PSI PLUS
W-K-M Through-Conduit Gate Valves

When you need a valve up to 2 - 9/16" bore, with a perfectly smooth through-conduit passage—no cavities and no projections—capable of a total seal up and downstream, specify W-K-M Through-Conduit Balanced Stem Gate Valves. No other valves can control high-volume products at super-pressures as efficiently and positively as these. The double-wedge parallel-expanding gate makes a dead-tight mechanical seal in either open or closed position. A bottom stem cancels out stem thrust for spin-open, spin-shut operation. These are the easiest-operating high-pressure valves ever made. Send for full information on W-K-M Through-Conduit Balanced Stem Gate Valves . . . P. O. Box 2117, Houston 1, Texas.

When So Much Depends on a Valve . . . Specify W-K-M.



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ACF INDUSTRIES

Check 5890 opposite last page.

manufacturers' current literature

This section features a variety of literature currently available from manufacturers. See also the other sections in this issue for new literature pertaining to those particular sections

Corrosion Control

Non-lubricated plug valves are now available in 8, 10 and 12" sizes. Teflon Valves—Continental Manufacturing Co.

Check 5891 opposite last page.

Plastic dall flow tube is designed for metering corrosive liquids. It is featured in booklet, "It's a Fact" —B-I-F Industries.

Check 5892 opposite last page.

Teflon sheet, rod, tube and tape are looked at in Buls T-110 and T-122—Crane Packing Company.

Check 5893 opposite last page.

Truck-mounted pumps are used by Sumco Engineering, Inc. to remove scale deposits from boilers, heat exchangers and processing equipment in various plants. Pumps utilized to handle corrosive chemicals in this system are among those considered in Pumps Information —Dorr-Oliver Incorporated.

Check 5894 opposite last page.

Saran-lined pipe, fittings, valves and pumps are available for systems operating in vacuum to 300-psi range at temperatures of below zero to +200°F. More information may be obtained from Dept. 1572LG9, Saran Lined Pipe Company.

Check 5895 opposite last page.

Alloy valves for corrosive services are made in metals such as Types 304 and 316 stainless steel, Aloyco 20, nickel, Monel, and Hastelloy B, C and D. Aloyco Valves—Alloy Steel Products Company.

Check 5896 opposite last page.

Sulfuric acid and other strong oxidizing agents don't hamper metering pump which forces liquid through Hypalon tube by means of wave-like action of steel fingers. Metering Pumps—Sigmamotor Inc.

Check 5897 opposite last page.

Corrosion-resistant equipment, including fume scrubbers, ducts and stacks, fans, tanks and heat exchangers, is explained in Corrosion Resistance Buls—Heil Process Equipment Corporation.

Check 5898 opposite last page.

Selecting solenoid valves for corrosive applications is topic of 16-page manual listing over 500 corrosive media. "Solenoid Valve Selections for Corrosive Applications"—Valcor Engineering Corporation.

Check 5899 opposite last page.

PVC pressure-sensitive tape for protection of metal surfaces conforms to odd or irregular shapes. Scotchrap Tape—Electrical Products Division, Minnesota Mining and Manufacturing Company.

Check 5900 opposite last page.

Epoxy enamel for corrosive protection at temperatures to 300°F is subject covered in four-page Tech Bul 1001—E. I. Du Pont De Nemours & Company (Incorporated.)

Check 5901 opposite last page.

Pump of stainless steel and Teflon for handling corrosives is reviewed in literature published by Lobee Pump & Machinery Co.

Check 5902 opposite last page.

Standards and costs for 16 standard types of impervious-graphite equipment are contained in 32-page report, "Data for Cost Estimation"—Falls Industries, Inc.

Check 5903 opposite last page.

Fiber-glass duct fans incorporate stainless-steel propellers or a special corrosion-resistant alloy (Dura). Available in 17 models in sizes of 14 to 42" for capacities to 32,500 cfm, they are further detailed in Bul 175—Aerovent Fan Company, Inc.

Check 5904 opposite last page.

Glass-lined pipe can be cut, printed, fire-polished and installed in the field. Under-sized gasket bolt holes and oversized flange bolt holes are incorporated to insure that gasket seats properly when joining sections. Complete details are contained in Bul 987—Dept. CP-91, Pfaudler Division, Pfaudler Permutit Inc.

Check 5905 opposite last page.

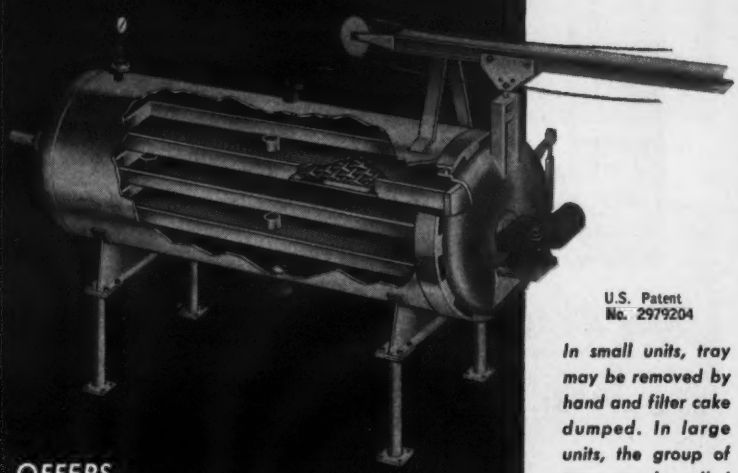
Teflon sheet, rods, tubes, tape, hose, machined parts and specialties are pictured in Teflon Cat—Plastics Products Division, Raybestos-Manhattan, Inc.

Check 5906 opposite last page.

New!

SHRIVER-YEISER

HORIZONTAL TRAY FILTER



U.S. Patent No. 2979204

In small units, tray may be removed by hand and filter cake dumped. In large units, the group of trays may be rolled out and mechanically rotated to dump cake, or rotated inside tank to drop cake into built-in hopper bottom for reslurrying, or for removal as solids by a scroll conveyor. Size, depth and number of trays depend on nature and amount of material to be processed.

OFFERS THESE ADVANTAGES:

1—Total recovery of solids, with no liquid heel.

2—Total recovery of liquid.

3—Totally enclosed filtration to handle hazardous materials.

4—Positive displacement washing of cake with minimum quantities of wash liquid.

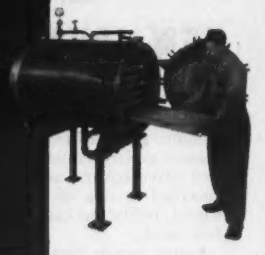
5—Separation of wash liquid from filtrate with minimum mixing.

6—Recovery of residual solvents without disturbing filter cake.

7—Intermittent filtering without danger of cake falling or moving.

8—Steaming, blow down and discharge of solids inside the tank to eliminate dust and dirt hazards.

9—Drying of solids in place, under vacuum, if necessary.



Write for Bulletin 152.

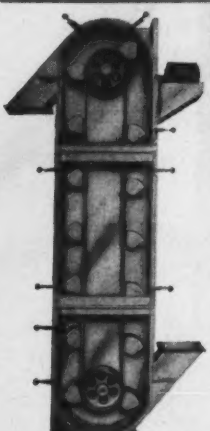
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Check 5907 opposite last page.

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standard designs adapted to your requirements

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Check 5908 opposite last page.

50% MORE G.P.M. AT NO EXTRA COST



NEW JOHN BEAN TRIPLEX PUMP

Now, with a re-designed fluid end, John Bean's new 7000 Series triplex pumps offer a 50 per cent increase in g.p.m. displacement at no extra cost with no increase in size or weight. In addition to greater capacity, the compact pumps feature easier-than-ever maintenance with "slip in" cylinder and valve covers, and valve seats. The fluid end may be specified in one of several materials to handle most any liquid, including cast or forged steel and 304 or 316 stainless steel.

- rated capacity from 1 to 90 g.p.m. at pressures from 100 to 10,000 p.s.i.
- spring loaded poppet valves
- fluid temperatures to 500° F.
- Outside packed, lifetime Sapphite plungers

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Check 5909 opposite last page.

CURRENT LITERATURE

Teflon-sleeved plug valves are depicted in four-page bulletin giving dimensions for both two- and three-way models. Bul SC-59—Continental Manufacturing Company.

Check 5910 opposite last page.

Glassed-steel reactors are available in standard sizes for lab (30- , 50- , and 100-gal), pilot-plant (200- , 300- , and 500-gal), and production (500- , 750- , 1000- , and 2000-gal) applications. The three types are dealt with, respectively, in Buls 927, 971 and 988—Dept. CP-91, Pfaudler Division, Pfaudler Permutit Inc.

Check 5911 opposite last page.

Epoxy finishes, which can be sprayed, brushed or rolled on wood, steel or masonry for corrosion protection, are specified in Adheron Information—Hauger-Beegle Associates, Incorporated.

Check 5912 opposite last page.

Teflon packings are available in latice braid style in sizes of ¼ to 1" in either spool or reel form. Packings are presented in Cat AD-185—Garlock Inc.

Check 5913 opposite last page.

Maintenance coating is designed for protection of structural steel, tanks, pipe and towers against weather, moisture, fumes and splash. Gacote NA-62—Gates Engineering Co.

Check 5914 opposite last page.

PVC ball valves are designed for corrosive applications and available in a complete line. The Walworth Companies.

Check 5915 opposite last page.

Pyrex-pipe story for corrosive applications is told in Bul PE-3—Plant Equipment Department, Corning Glass Works.

Check 5916 opposite last page.

Corrosion-resistant valves are made in variety of styles for different applications. One stainless-steel angle relief model has working pressures of 150 and 300 psi. Available with flanged inlet and outlet in sizes of ½ x 1" to 6 x 12", it can be furnished with flanged-inlet/screwed-outlet, screwed inlet and outlet. Corrosion-resistant Valves—The Wm. Powell Company.

Check 5917 opposite last page.

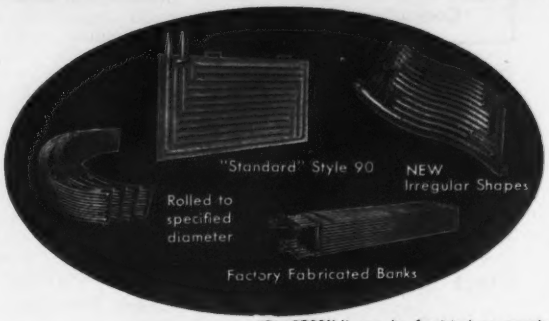
Ceramic-metal composites are designed to resist many corrosives in 500-to-1500°F temperature range. Data on equipment made from these materials may be obtained from Dept. CP-91, Pfaudler Division, Pfaudler Permutit Incorporated.

Check 5918 opposite last page.

PLATECOIL®

FOR ALL KINDS OF TANK AND PROCESS HEATING AND COOLING

- Built to fit application requirements
- High heat transfer capacity
- Compact units save space
- Easy to install
- Easy to remove for cleaning
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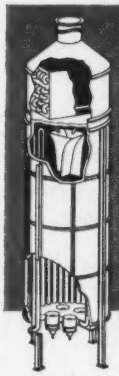
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PLATECOIL® DIVISION

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"HI-TURBIANT" HEATERS

Direct-fired process streams (and heating transfer fluids) get hot efficiently — **fast** and **economically** — when a Western Precipitation "Hi-Turbiant" Heater does the job.

A unique and exclusive reradiating baffle is the secret. It assures optimum heat absorption . . . and permits a greater height-to-diameter ratio that keeps friction losses low — pumping efficiency high — and saves floor space. Full range of sizes — 250,000 to 40-million BTU/hr.

WANT DETAILS? For literature, write Western Precipitation, 1000 W. 9th St., Los Angeles 54, Calif. (In Canada, write 8285 Mountain Sights Avenue, Montreal, P. Q.)

WESTERN PRECIPITATION

Check 5920 opposite last page.

Chemical Materials

Basic design techniques for continuous-column adsorption systems using granular carbons are taken up in Adsorption Systems Bul—Activated Carbon Division, Pittsburgh Chemical Co., Subsidiary of Pittsburgh Coke & Chemical Co.

Check 5921 opposite last page.

Intermediates are covered in four sets of data. Treated are trimethylolpropane, 1,3-butylene glycol, 2-ethylhexanol, and acrylate esters—Celanese Chemical Company, Division of Celanese Corporation of America.

Check 5922 opposite last page.

Phosphoric acid which shows a consistent 75% concentration of H_3PO_4, is subject of information put out by General Chemical Division, Allied Chemical Corp.

Check 5923 opposite last page.

Benzotrifluoride and its ortho-, meta-, and para-chloro isomers are taken up in 12-page data file reviewing chemical and physical properties. Bul 12-A—Hooker Chemical Corporation.

Check 5924 opposite last page.

Self-crosslinking vinyl-acrylic copolymer latex cross-links rapidly upon drying without addition of thermosetting resins. Specifications are included in X-Link 2833 Information—National Starch and Chemical Corporation.

Check 5925 opposite last page.

Monomers, emulsifiers and reducing agents . . . and their use in emulsion polymerization . . . are discussed in Emulsion Polymerization Tech Literature—Dept. SP-3, Rohm & Haas.

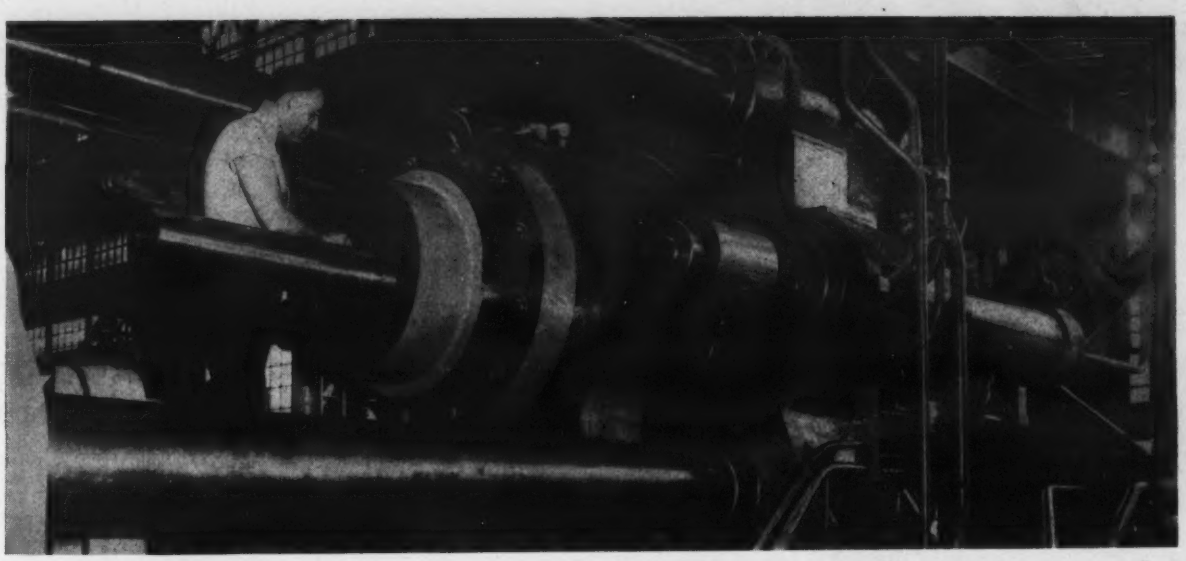
Check 5926 opposite last page.

Paraformaldehyde is free-flowing white solid composed of approximately 91% formaldehyde. It can be utilized in production of high-solids resins (urea, phenolic and resorcinol) which must be dehydrated for optimum properties. More information on the material is contained in Paraformaldehyde Data—Celanese Chemical Company, Division of Celanese Corporation of America.

Check 5927 opposite last page.

Antioxidant Dalpac is important ingredient in animal and poultry feeds, as well as in plastics, rubber, vitamins, resins and gums. Aquapel, a synthetic sizing agent, is utilized in paper-parchment applications. Aquapel and Dalpac—Hercules Powder Company Incorporated.

Check 5928 opposite last page.



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for INDUSTRY We're old hands at building complete machines and special equipment for use in a wide range of industries. For 44 years our large and amply equipped shops have produced items ranging from small tanks to huge fractionating towers, pressure vessels, stills, plate work and special-purpose machinery for the chemical, petroleum and other industries.

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Check 5929 opposite last page.

NEW

100% POLYPROPYLENE WORK CLOTHES FOR SUPERIOR

ACID RESISTANCE



Quality Fabrics by TRAVIS Fabrics, Inc.

Now, Worklon offers work clothes of 100% Polypropylene, a new fabric development providing superior resistance to strong acids and caustics.

Especially designed for corrosive areas, Polypropylene apparel is lightweight with good fabric strength, dries quickly, and offers greater wearing comfort and better shape retention.

Polypropylene garments are featured in Worklon's new Fall Catalog along with the latest industrial colors—green, grey, blue—in Dynel and Dacron.

For the latest styles in acid-resistant, lint-free and static-free work clothes, choose from America's largest selection of special-purpose industrial apparel . . . all illustrated in Worklon's new 1961 Fall Catalog. Write for your copy, today!

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Check 5930 opposite last page.

CURRENT LITERATURE

Chlorine facts are tabulated in 76-page bulletin including charts and graphs on physical properties, descriptions of equipment and containers for safety of handling, and lifting of many chlorine services. Bul 125—Hooker Chemical Corporation.

Check 5931 opposite last page.

Silicone additives have been especially developed for use in polyurethanes. Available for various types of foams, they are covered in Silicones Data—Dept. 2721a, Dow Corning Corporation.

Check 5932 opposite last page.

t-Alkyl amines are topic of 44-page book giving a number of reactions. t-Alkyl Amines Book—Dept. SP-12, Rohm & Haas.

Check 5933 opposite last page.

Metallic nitrates, of aluminum, barium, cadmium, chromium, cupric, lead, ferric, nickelous, mercuric, manganuous and magnesium types, are included in Metallic Nitrates Tech Data—General Chemical Division, Allied Chemical Corporation.

Check 5934 opposite last page.

Alkylphenols' reactions, uses and physical properties are tabulated in 18-page Alkylphenols Booklet—Dept. SP-19, Rohm & Haas.

Check 5935 opposite last page.

Benzoyl chloride permits you to easily place a benzoyl group in an organic compound, especially through Friedel-Crafts reactions. Additional information is included in Benzoyl Chloride Data Sheet—Hooker Chemical Corporation.

Check 5936 opposite last page.

Silicone defoamers are topic of data put out by Dept. 2721, Dow Corning Corporation.

Check 5937 opposite last page.

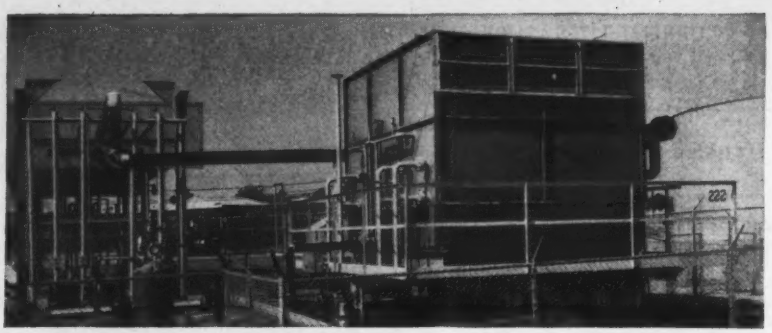
Processing Equipment

Chemical-processing equipment and materials of all types will be on display on the 28th Exposition of Chemical Industries in New York's Coliseum from November 27 to December 1. Free advance registration is available from International Exposition Company.

Check 5938 opposite last page.

Fluidized-bed equipment is available as dryers, coolers and reactors for free-flowing granular materials to ¼" particle size. Full story is contained in Bul FBD-61—Process Equipment Division—Louisville Dryers, General American Transportation Corporation.

Check 5939 opposite last page.



SAVE POWER AND COOLING WATER USING AIR TO CONDENSE VAPORS

NIAGARA *AERO*® VAPOR CONDENSERS give sustained full capacity in condensing vapors by evaporative cooling with only nominal use of water. You have no problem of water availability, or disposal, or quality, or temperature.

The system is self-contained . . . no cooling tower or spray pond is required. You save not only the cost of condensing water but also the expenses of piping and pumping, and the cost of water handling equipment.

In the Niagara Vapor Condenser the heat is removed at the rate of input and the cooling effect, directly proportional to the load, is controlled by varying the amount of air passing over the cooling surfaces. Operation is automatic and trustworthy.

Liquids and vapors are always held at constant temperature under close control. You get uniform distillation products the year round. You get better quality and increased production.

Non-condensibles are effectively separated and sub-cooled, giving you better vacuum pump operation. You save power and steam.

Niagara *Aero* Vapor Condensers are manufactured in standard units in a range of capacities up to thirty million BTU's. Write for full information; ask for Bulletin 139-R.

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Niagara District Engineers in Principal Cities of U.S. and Canada

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Simple, automatic, mechanical handling of any size or type of drum—single or multiple.

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Check 5941 opposite last page.

Liquid-processing equipment, including filters, mixers, pumps and tanks, is pictured, diagramed and specified in 24-page Liquid Processing Equipment Bul—Alsop Engineering Corporation.

Check 5942 opposite last page.

Vapor condensers give sustained full capacity in condensing vapors by evaporative cooling with nominal use of water. Manufactured in standard units in range of capacities to 30-million Btu, the condensers are specified in Bul 139-R—Niagara Blower Company.

Check 5943 opposite last page.

Processing equipment, including pressure filters, ion exchangers, demineralizers, water softeners, centrifugal pumps, heat exchangers and waste-treatment systems, is pictured and explained with reference to characteristics and applications in 30-page New Products Bul—Industrial Filter & Pump Mfg. Co.

Check 5944 opposite last page.

Deionizers, of small mixed-bed design, large mixed-bed type, and combination anion-and-cation style, are covered, respectively, in Buls 513, 512A and H4—Elgin Softener Corporation.

Check 5945 opposite last page.

Packaged hydrogen plants are available in production ranges of 5000 to 25,000 CFH. Complete description of process for high-purity hydrogen production, with data and flow sheets, is contained in Hydrogen Plants Bul — Girdler Corporation, Subsidiary of The Chemical & Industrial Corp.

Check 5946 opposite last page.

Tableting equipment of various types and pharmaceutical equipment, including batch mixers, rotary granulators, tablet counters, hard-capsule fillers and binders, and triturate machines, are pictured in eight-page Pharmaceutical Equipment Bul—Arthur Colton Company, Division of Snyder Corporation.

Check 5947 opposite last page.

Steam-turbine generators installed in a midwest petrochemical plant supply steam to process with electric power as a byproduct. Complete information on types and ratings, from 20,000 kw to largest, is contained in Buls 7654A and 9448—Industries Group, Allis-Chalmers.

Check 5948 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Application of low temperatures for air and gas separation is topic of 74-page bulletin illustrated with several color photographs. Sections are incorporated on low-temperature plants, recovering processes (including diagrammatical layouts and descriptions of processes), design features, and charts and diagrams. Latter is 14-page section covering physical constants of various gases and incorporating curves for vapor pressure, latent heat, isothermal compression, latent heat of refrigerants, and temperature enthalpy. Gas Separation Plants Bul, — American Messer Corporation.

Check 5949 opposite last page.

Ammonia-process detailed description and other data is contained in 12-page booklet, "Ammonia"—The M.W. Kellogg Company, Subsidiary of Pullman Incorporated.

Check 5950 opposite last page.

Processing-equipment line is built at plant on Delaware River with direct access by rail and water. Sun Shipbuilding & Dry Dock Company.

Check 5951 opposite last page.

Processing-equipment line includes kilns, mills and crushers. Traylor Engineering & Manufacturing, Division of Fuller Company, Subsidiary of The General American Transportation Corporation.

Check 5952 opposite last page.

Process Instrumentation

Metering-pump line incorporates add-on-construction feature making it possible to modify pumps already in the field. Feeds can be added. Optional micrometer screw-stroke adjustments (to permit change in feed rate while pump is operating) can be installed. Full story on this development is contained in Meeting Pumps Literature—Hills-McCanna Company.

Check 5953 opposite last page.

Temperature recorder is specified on single-page Product Data Sheet 5—Industrial Instrument Division, The Electric Autolite Company.

Check 5954 opposite last page.

Pneumatic receiver is four-inch-chart model incorporating simplified uniformly planned control switching. Data on unit is published by The Bristol Company, Subsidiary of American Chain & Cable Company, Inc.

Check 5955 opposite last page.

Diaphragm control valves are subject of data tabulated in Bul CV53—Kieley & Mueller, Incorporated.

Check 5956 opposite last page.



Check 5957 opposite last page.

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CARRIERS



Series # 200 Carriers

Series #700 Carrier

35° and 45° Deep Trough Carriers

Pneumatic "Impact" Carriers

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Check 5958 opposite last page.

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Check 5959 opposite last page.

CURRENT LITERATURE

Rotameters incorporate external clamp which prevents tube from vibrating loose or dislodging even under sudden flow surges. The rotameters are available in ⅜ to 3" tube sizes with 5 or 10" scales. Information on them may be obtained from Dept. V-4.22—Wallace & Tiernan, Inc.

Check 5960 opposite last page.

Portable surface pyrometers, for measuring temperatures of mold cavities and flat surfaces, drier, calender and mill rolls, and plastic batches and extrusions, are taken up in Bul 194-SR—Cambridge Instrument Co., Inc.

Check 5961 opposite last page.

Tubeless strip-chart recorders are accurate to within ±0.2%. They are taken-up in Bul M—West Instrument Corporation.

Check 5962 opposite last page.

Specification of solenoid valves is taken-up in eight-page brochure, complete with drawings, diagrams, charts and curves. "How to Specify Solenoid Valves"—Valcor Engineering Corp.

Check 5963 opposite last page.

Floatless liquid-level controls each consist of relay connected to one or more electrodes, in variety of types to meet various requirements. These systems are explained in Liquid-level Controls Data—The B/W Controller Corporation.

Check 5964 opposite last page.

Metering pumps can handle flow rates of few drops to 15.7 gpm at pressures to 7000 psig for manual or instrument controls. Additional features are outlined in Cat 59—Process Equipment Division, Lapp Insulator Co., Inc.

Check 5965 opposite last page.

EDITOR-WRITER

CHEMICAL PROCESSING Magazine needs man for editorial staff. Prefer technically trained man with experience in production or engineering. Must have ability to dig out, interpret and simplify technical information. Should have some demonstrated flair for clear, concise writing. Send resume giving age, education, experience and salary range to

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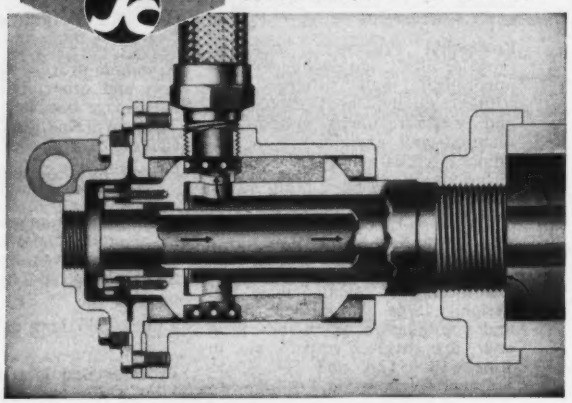
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Type SN Johnson ROTARY PRESSURE Joint

There's not another rotary joint like the Johnson Type SN. Used where inlet or outlet pipe must rotate with the roll—on certain paper machines, drilled rolls of rubber or plastic mills and calenders, double shell dryers, and the like. Needs no external supports of any kind. Like all Johnson Joints the Type SN seals without packing, needs no lubrication or adjustment.

Investigate Johnson Joints for all steam-heated or water-cooled rolls. Handle Dowtherm, Monsanto Aroclors, hot oils too. Sizes to 8". For data on Type SN write for Bulletin N-2002.

THE JOHNSON CORPORATION
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Check 5966 opposite last page.

BETTER PERFORMANCE

- Less slippage
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Because they are "engineered" for their job—in precisely controlled textures, shapes and types—and are noted for outlasting other packings at least 3 to 1! Why not get the advantage of this tremendous saving in maintenance and down-time?

Pumcup designs include the conventional and 45° bevel types in a full range of sizes for all reciprocating pump and cylinder requirements.

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DARLING VALVE & MANUFACTURING CO.
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DARCOVA

TRADE MARK PUMCUPS

Check 5967 opposite last page.

Thermocouples can be bent to almost any configuration to measure temperatures of −450 to +4000°F and higher. Good for pressures to 50,000 psi, thermocouples are indexed in 48-page Cat TC-5—Thermo Electric Co., Inc.

Check 5968 opposite last page.

Automatic controlled-feeding systems for liquids and solids are available for batch and continuous processing. B-I-F Industries, Incorporated.

Check 5969 opposite last page.

Size Reduction

Size-reduction unit is available with either 6- or 12-knife rotor in straight- or shear-cut design. Screen area is 8.4 sq ft in unit covered in Bul 213—Sprout, Waldron & Co., Inc.

Check 5970 opposite last page.

Muller-type grinders and mixers both utilize revolving-pan principle. More detailed information is available in form of Mixers and Grinders Literature—Clearfield Machine Company.

Check 5971 opposite last page.

Pulverizer-classifier, in one application involving hydroxy ethyl cellulose, yielded to 1500 lb/hr. Information on the unit is available from The Bauer Bros. Co.

Check 5972 opposite last page.

Lever-type pulverizer crushes materials from ¼" to dust in one operation. How this is done is explained in pages of Crushers Literature—Universal Road Machinery Co.

Check 5973 opposite last page.

Variety of mills for various grinding problems are specified in Grinding Details—Hardinge Company, Incorporated.

Check 5974 opposite last page.

Drying and Heating

Liquid-phase heat-transfer systems, for high-temperature low-pressure applications, are tabulated in Bul 597—Parks-Cramer Company.

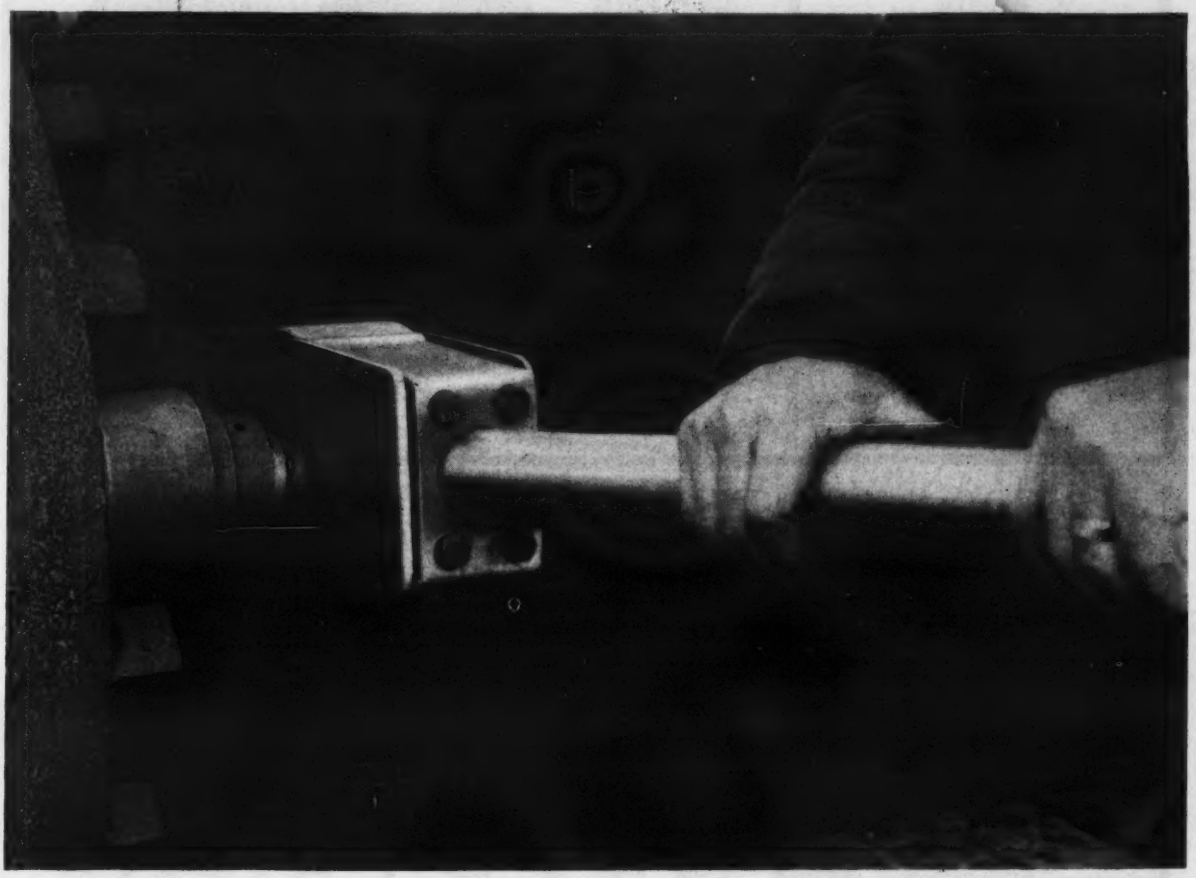
Check 5975 opposite last page.

Conical dryers have special filter on vacuum line, positioned rigidly in place above material, to keep fine particles from being drawn into line. For full description and specifications, See Cat C-1—Paul O. Abbe Inc.

Check 5976 opposite last page.

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is a wrench like no other — and will work where no other can. It's the world's first manual impact wrench. Loosens frozen nuts and bolts in seconds . . . tightens with precise accuracy every time. SWENCH is completely portable . . . needs no outside power — yet multiplies torque many times. It safely handles more bolt sizes than any comparable power wrench, but costs less. Read how you'll save with the SWENCH:



SWENCH® cuts man-hours on Bayway Refinery jobs

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The amazing SWENCH works anywhere, carries its power built-in. Exerts many times the energy needed to pull the handle, smoothly and evenly: gives you more power with greater safety.

Six models cover bolt sizes from ½" to 2½". For the full story on SWENCH, how it works, what it costs, how it saves, see your local distributor, or write:

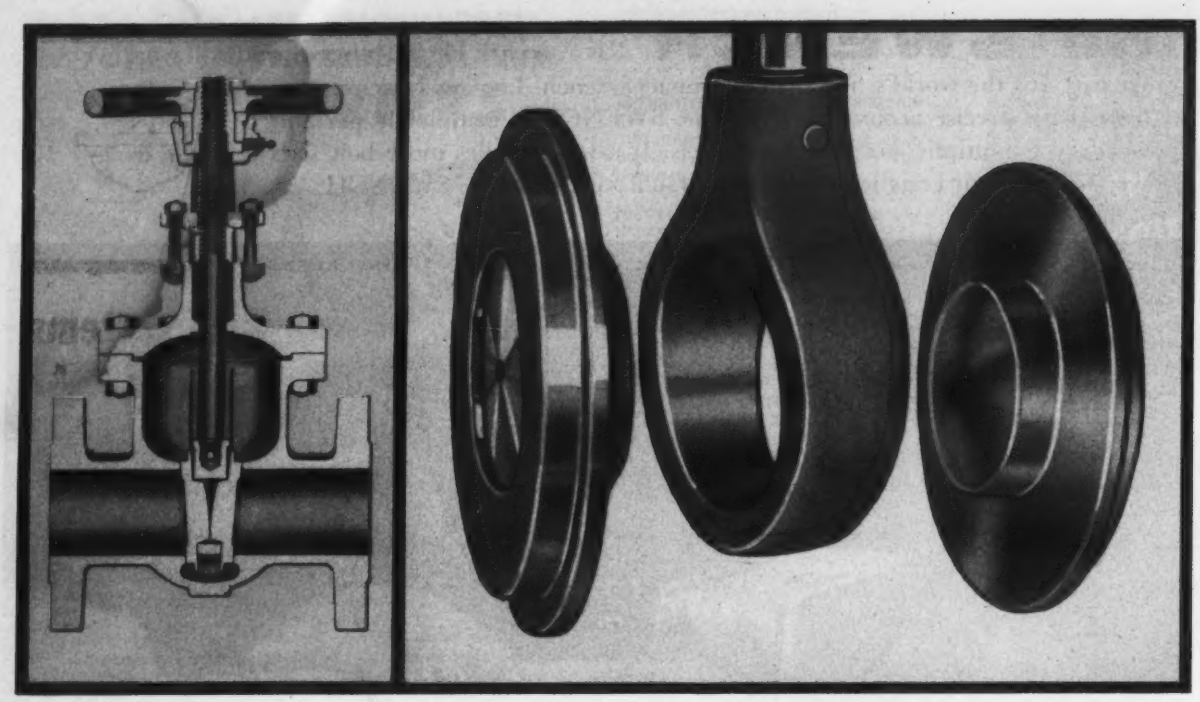
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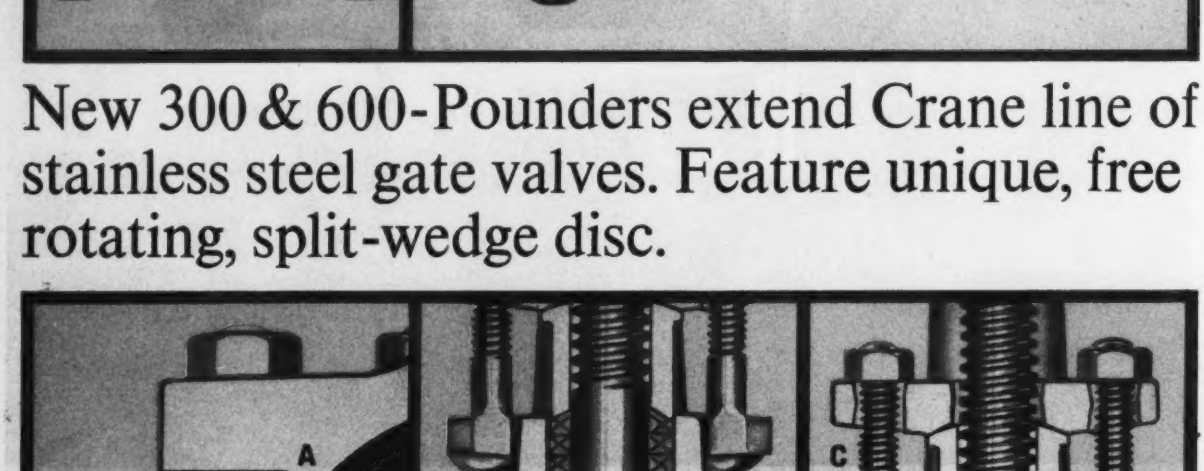
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Check 5977 opposite last page.



New 300 & 600-Pounders extend Crane line of stainless steel gate valves. Feature unique, free rotating, split-wedge disc.



The unique Crane split-wedge disc design features two identical disc halves, fitted back to back in a carrier that is fastened to the valve stem. The moment the lower portions of the disc halves contact the seats, the carrier exerts uniform pressure on the beveled sides of both disc trunnions, forcing the disc halves outward against the seats. This results in a perfect seal and long trouble-free valve life. Free rotation of disc halves prevents wear and galling, keeps seat faces clean.

Other quality features include **(A) Recessed, spiral wound bonnet gasket** which permits face to face abutment of body and bonnet flange. Provides predetermined gasket loading. **(B) Extra deep stuffing box** for tightness and long life. **(C) Thru stud-bolts** for easy upper valve servicing.

There's a wide choice of Crane Stainless Steel Gate Valves in 18-8 SMo or CRANELOY 20 in 150, 300 and 600 Pound Classes with screwed or flanged ends, temperatures up to 800 F. (300 & 600 Pound) . . . up to 500 F. (150 Pound).

For complete details contact your Crane Distributor. Or write to Crane Co., Dept. E, Industrial Products Group, 4100 South Kedzie Ave., Chicago 32, Illinois. In Canada: Crane Ltd., 1170 Beaver Hall Square, Montreal.

AT THE HEART OF HOME AND INDUSTRY

CRANE

VALVES AND PIPING
ELECTRONIC CONTROLS
PLUMBING
HEATING • AIR CONDITIONING

Check 5978 opposite last page.

CURRENT LITERATURE

Flash drying of powdered materials and fluid-bed systems are reviewed in Cats 82 P and 88 P, respectively—Raymond Division, Combustion Engineering, Inc.

Check 5979 opposite last page.

Plate-type heat-exchange coil is designed for operating pressures to 250 psig. Various styles are pictured in Bul P54—Platecoil Division, Tranter Manufacturing, Inc.

Check 5980 opposite last page.

Electric heating mantles are designed for applications where steam or other heating mediums are not available, where higher-than-steam temperatures are required, and in laboratories where accurate control of distillations or fractionations is needed. Additional information is incorporated in Heating Mantles Tech Data—Dept. CP, Glas-Col Apparatus Company.

Check 5981 opposite last page.

Electric immersion heaters are designed especially for high-temperature/high-pressure applications and are furnished with standard 150-psi flanges or special flanges for pressures to 4500 psi. More facts are presented in Cat 60—Edwin L. Wiegand Company.

Check 5982 opposite last page.

Separation

A venturi scrubber installed on a reburnt line kiln in California was designed to handle 35,000 cfm of hot gases flowing at 450°F. It provides gas-cleaning efficiency of over 99% on lime dust and above 90% on soda fumes. SF Venturi Scrubbers—Gas Scrubber Division, Chemical Construction Corporation.

Check 5983 opposite last page.

Separators' application data may be obtained from Department 33-3, Southwestern Engineering Co.

Check 5984 opposite last page.

Classifiers line includes gravitational models to replace screens and sieves in 20- to 65-mesh range, gravitational-inertial design for separation in 65- to 200-mesh range, and centrifugal models for 200-mesh to 20-micron size range. Classifiers—Dept. 11-H, Buell Engineering Co.

Check 5985 opposite last page.

Horizontal pressure filters have been applied to filtration of a solution at pH 5.5, 180°F, sp-g 1.3, containing 0.4% solids (by weight), with provisions for washing the filter cake in place. Story of this use is written-up in Application Report 100P-12-N-7—Industrial Filter & Pump Mfg. Co.

Check 5986 opposite last page.

Getting unwanted iron out of product and flow lines is job of grate magnets which are depicted in catalog published by Eriez Manufacturing Co.

Check 5987 opposite last page.

Cyclones, scrubbers and filters for solution of various dust-recovery problems are tabulated in Bul A-9150—The Ducon Company Inc.

Check 5988 opposite last page.

Dust- and fume-control problems are discussed in Bul 562-D—Wheelabrator Corporation.

Check 5989 opposite last page.

Permanent-magnetic ferrous traps are made of cast one-piece bodies to withstand working pressures to 150 psi and temperatures to 850°F. They are specified in Magnetic Traps Data—Eriez Manufacturing Co.

Check 5990 opposite last page.

Centrifuge is designed for intermediate- and low-vapor-pressure applications. It will continuously recover crystalline solids from slurries, remove amorphous solids from suspensions, classify solids and clarify liquids. Details on unit are available from The Sharples Corporation.

Check 5991 opposite last page.

Four wipers wet entire wall of evaporator with uniform thin film. Free-floating blades are held in contact with wall by centrifugal force. They are specified in Bul 991—Dept. CP-91, Pfaudler Division, Pfaudler Permutit Inc.

Check 5992 opposite last page.

Polyester filter plates and frames are treated in Bul 50—William R. Perrin Ltd.

Check 5993 opposite last page.

Filter media can be made of hundreds of different fibers, constructions and grades by The Lamports Company.

Check 5994 opposite last page.

Laboratory Apparatus

Microbiological-equipment line includes freeze-dry equipment, water stills and deionizers, sterilizers, continuous-culture apparatus, dry boxes and germ-free-life apparatus. Scientific and Industrial Department, American Sterlizer.

Check 5995 opposite last page.

Teflon tube connectors are available in sizes to fit 3- to 12-mm glass tube and in standard lengths of 1-¾" (special lengths on request). Teflon Tube Connectors—Pennsylvania Fluorocarbon Co.

Check 5996 opposite last page.

Laboratory pilot-scale flaker was designed for experimental flaking operations for a Texas oil and refining company. It incorporates internally spray-cooled stainless-steel drum and an electrically heated stainless-steel feed pan. Additional information on flakers may be obtained from Goslin-Birmingham Manufacturing Co., Inc.

Check 5997 opposite last page.

Valves

Forged-steel valve has Stellite-faced seats lapped to two- to three-micro-inch finish. Additional details may be obtained from R-P&C Valve Division, American Chain & Cable Company, Inc.

Check 5998 opposite last page.

Lubricated plug valves are specified in Bul V-217—Rockwell Manufacturing Company.

Check 5999 opposite last page.

Check valves are available in sizes of 2 to 48", ASA Series 125 through 2500. They may be obtained with various end connections, such as raised-face, ring-joint, and weld-neck. Duo-Chek Check Valves—Mission Valve and Pump Company, Subsidiary of Mission Manufacturing Company.

Check 6000 opposite last page.

Pinch valves are available in sizes of 1 to 14" ID for pressures to 150 psi and temperatures to 200°F. They are indexed in Cat 609—Mine and Smelter Supply Co.

Check 6001 opposite last page.

Forged-steel integral-seat meter and gage line valves are available in union-bonnet, screw-bonnet and no-bonnet types. They are among the many items included in catalog reviewing complete line of valves, fittings, flanges and unions. Cat F-10—Dept. 24A-FCE, Henry Vogt Machine Co.

Check 6002 opposite last page.

Valves are treated in Gear-Vac and Chemical Dispensing Valves Buls—Eco Engineering Company.

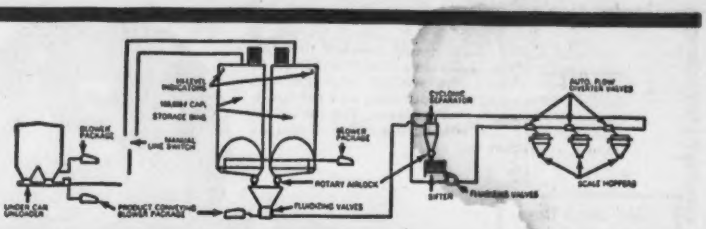
Check 6003 opposite last page.

Valves, of bronze, iron, forged steel, cast steel, and ductile iron, are taken-up in information put out by The Ohio Injector Company.

Check 6004 opposite last page.

Ram-type drain valves incorporate design in which, inclosed position, piston or ram extends up into tank to preclude outlet-plugging. Information on these valves is included in Drain Valves Cat—Strahman Valves Inc.

Check 6005 opposite last page.

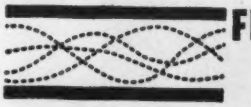


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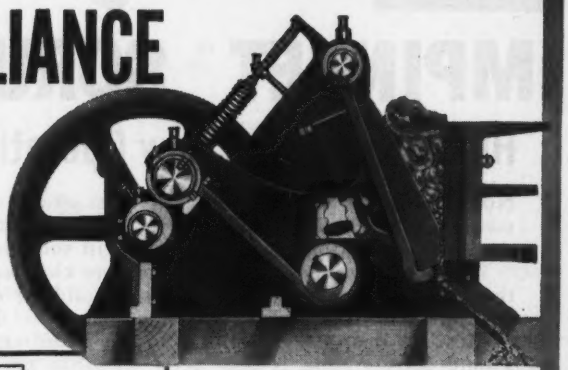


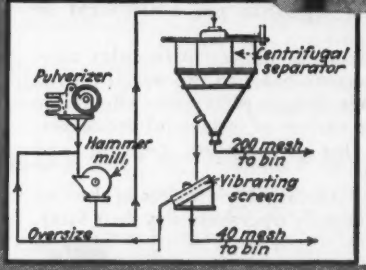
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Check 6006 opposite last page.

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CRUSHES HARDEST MATERIALS ¼" to dust in one operation





Successfully reduces limestone, emery rock, sand stone, granite, shale, iron ore, many others. No pre-breaking needed.
Ideal for first-stage preparation of material to be passed to a grinding mill and separator . . . see drawing.
Heavy-duty all-steel construction. Very low maintenance cost. Backed by 50 years experience.
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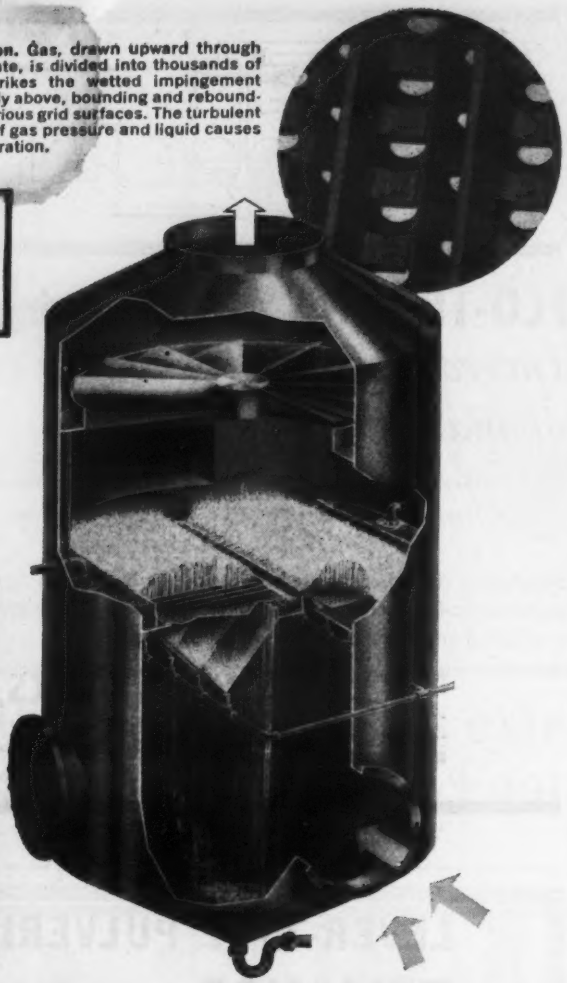


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Check 6007 opposite last page.

Jet-swirl action. Gas, drawn upward through perforated plate, is divided into thousands of jets. Each strikes the wetted impingement surface directly above, bounding and rebounding against various grid surfaces. The turbulent intermixture of gas pressure and liquid causes complete saturation.

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There are no moving parts. Complete cleaning results from the turbulent interaction of gas and liquid, as effected by the impingement baffle plate.

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The IMPINJET Scrubber utilizes the proven principles contained in the original Harmon patents basic in the development of the impingement plate scrubber. Single-plate units effectively clean gases resulting from a wide variety of industrial processes. Multi-plate units are available for absorption, cooling and extra-high-efficiency applications.

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Check 6008 opposite last page.

CURRENT LITERATURE

Ball valve has secondary metal seats to provide effective fluid-flow shut-off in event of fire (and corresponding loss of valve's soft primary seats). It is among subjects considered in Fluid Services Guide —Jamesbury Corp.

Check 6009 opposite last page.

Ball valves which are good for service to 1000°F are subject of catalog containing specifications, temperature-pressure relationships, C_v values, dimensions, weights, materials, and service recommendations. Second catalog gives specifications and service recommendations for diaphram valves. Cats 1200 and 104—Hills-McCanna Company.

Check 6010 opposite last page.

Ball-valve line includes 1 through 14" flanged models for pressures to 150, 300 and 600 psi. Also available are ⅛ to 2" screwed-end models for pressures to 3000 psi. Details may be obtained from Hydromatics, Inc.

Check 6011 opposite last page.

Fluids Handling

Joint sealer contains no lead and is listed by Underwriters' Laboratories for gas, oil, propane and butane equipment. Leak Lock—Highside Chemicals Incorporated.

Check 6012 opposite last page.

Spray nozzles are available in orifices of 0.025 through 1-13/16" in capacities of 0.15 to 230 gpm. They are delineated in Bul 5900—Binks Manufacturing Company.

Check 6013 opposite last page.

Rotary joint data is tabulated in Bul N-2002—The Johnson Corporation.

Check 6014 opposite last page.

Spray-nozzle line is suitable for many multiple-nozzle applications because square spray patterns "stick together." Further information is tabulated in Bul 105 and Cat 24—Spraying Systems Co.

Check 6015 opposite last page.

Teflon packings have resilient low-gland-pressure design and are available in wedge and cup-and-cone versions. They are illustrated in Bul CP-552—Chemical & Power Products, Inc.

Check 6016 opposite last page.

Plastic drum faucets are taken-up in three single-page bulletins also containing information on pail rack and pump and drum pump. Forms 401, 407 and 413—Multi-Meter Corporation, Division of Rieke Metal Products Corporation.

Check 6017 opposite last page.

MULTIPLE BATCH GRINDING WITH VERSATILE abbé JAR ROLLING MACHINES



Style M, Two-Tier machine, with two rollers per tier, mounted on built-in storage cabinet.

Multiple batches of similar or different materials can be economically ground, pulverized or mixed simultaneously on a versatile Abbé Jar Rolling Machine.

Jars, bottles or containers of different sizes can be used at one time. Each jar can be removed after its full grinding or mixing cycle has been completed—without stopping the machine.

Modern, rugged Abbé Jar Rolling Machines are available to handle single or parallel rows of jars, and in double or triple tiers for processing as many jars as required. Standard porcelain or steel jars range in size from 1 quart to 6 gallons. Built-in storage cabinets on tiered machines are optional.

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Designers and Manufacturers of Ball, Pebble and Jar Mills • Pulverizers Sifters • Cutters • Mixers

Check 6018 opposite last page.

Ductile-iron pipe fittings feature vibration and thermal-shock resistance. Additional details are available from The Kuhns Brothers Co.

Check 6019 opposite last page.

Spray guns, high-pressure spray nozzles and high-pressure washers are specified and pictured in single-sheet Bul-L-1161, eight-page Bul L-884B and four-page Bul L-1106-C, respectively—Industrial Sales Department, John Bean Division, Food Machinery and Chemical Corporation.

Check 6020 opposite last page.

Pipe fittings, including couplings of several types, are featured in Pipe Fittings Information—Victaulic Company of America.

Check 6021 opposite last page.

Pipe mastic is specified in Bul CP7—Royston Laboratories, Inc.

Check 6022 opposite last page.

Asbestos-sheet gasket material and pre-cut asbestos gaskets are listed in eight-page Form 500C—Durabla Manufacturing Company.

Check 6023 opposite last page.

Braze-seal weldless tube fitting withstands working pressures to 19,000 psi and temperatures to 1500°F. Full story is contained in Bul 3120—Imperial-Eastman Corporation.

Check 6024 opposite last page.

Flexible-rubber pipe has multiple plies of heavy duck and reinforced spiral of steel spring wire. It is taken up in Bul 7152—Manhattan Rubber Division, Raybestos-Manhattan, Inc.

Check 6025 opposite last page.

Pumps

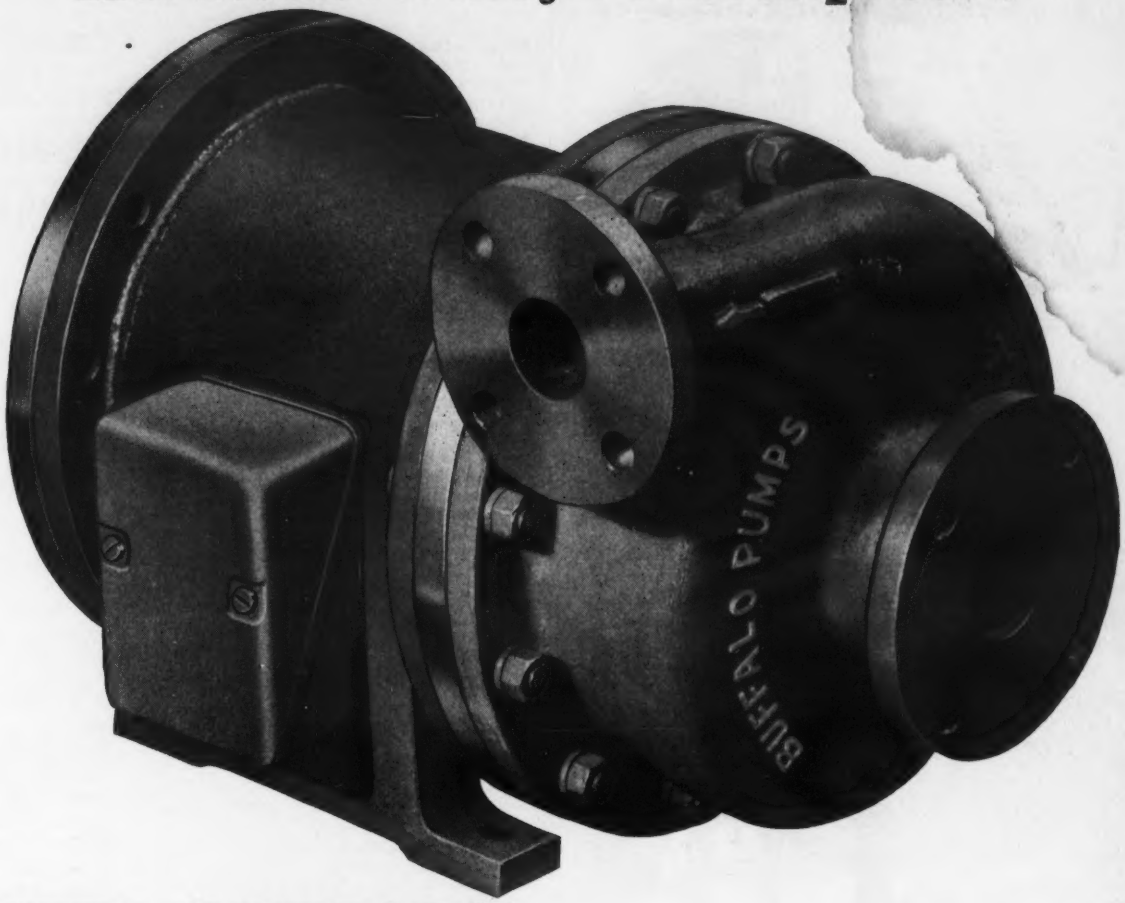
Centrifugal pumps are available in sizes of 1 x 1″ to 10 x 8″, with capacities of ½ to 4250 gpm and heads to 345′. Durco Pumps—The Duriron Company Inc.

Check 6026 opposite last page.

Vertical duplex and triplex pumps are looked at in five bulletins. The two dealing with duplex units consider both inside- and outside-packed units and inside-packed models alone. Remaining three take up inside-packed, outside-packed high-pressure, and inside-packed lower-pressure triplex pumps. Afore-mentioned topics are considered, respectively, in Buls L-1125, L-1170, L-1438, L-1167 and L-1166—Industrial Sales Department, John Bean Division, Food Machinery and Chemical Corporation.

Check 6027 opposite last page.

Hermetic... they're Leakproof!



NEW 'BUFFALO'

CAN-O-MATIC® *PUMPS*

with self-adjusting bearings

Now, from Buffalo Pumps, a leakproof line of totally enclosed hermetic pumps so simple in design they can be taken apart and re-assembled with open-end wrenches and a screwdriver.

Designed for the chemical, petrochemical, atomic energy, and marine industries, the new Can-O-Matic's are the most practical, durable and easily maintained pumps in the hermetic field.

Long-life bearings represent a great new advance in canned pump design. Lubricated by the liquid being pumped, they absorb both radial and axial thrusts... automatically compensate for bearing and journal wear. Toxic or volatile, liquids cannot escape... air cannot leak in.

Thirteen sizes with 1″ to 5″ discharges are now available for a wide range of applications. Standard units with stainless steel rotor cans are designed for 120 psig and 40° through 250° F. operations. Special models are available for higher pressures and temperatures, and a variety of dangerous corrosive liquids.

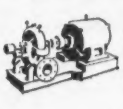
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'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

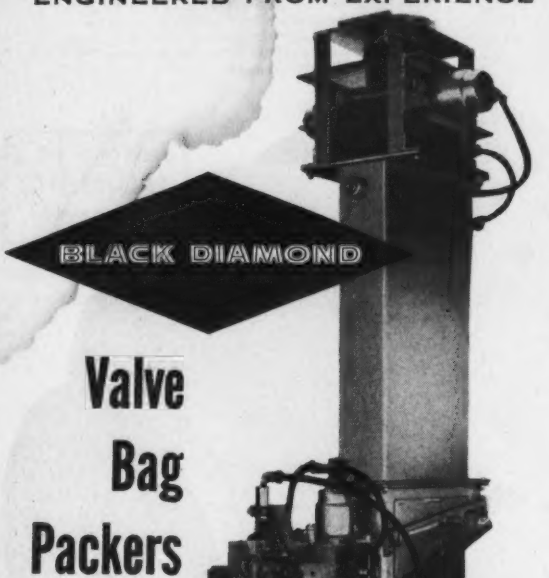

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.


'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.


Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

Check 6028 opposite last page.

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Valve Bag Packers

You can depend on Black Diamond for more efficient valve bag packing. These rugged packers are designed to pack free-flowing reasonably dry, granular or powdered materials in valve type bags weighing from 25 to 100 lbs. packed weight. Available in AIRFLOW*, PRESSUREFLOW* or auger type in single or multiple units.

Rugged construction assures minimum maintenance and replacement parts. These dependable packers are easy to install, simple to operate and provide fast, clean bag filling with accurate weights. Performance guaranteed.

Detailed information on all equipment is available. A direct factory sales and service office is located near your area. Write or phone for personal consultation on your packing problem.

*TRADEMARKS OF BLACK PRODUCTS COMPANY, CHICAGO

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MANUFACTURERS SINCE 1912

Check 6029 opposite last page.

CURRENT LITERATURE

Pump accessories, including pressure regulators, relief valves, strainers, steel air chambers, pressure gages, suction gate valves, and discharge cut-off valves are presented on single-page Bul L-1169—Industrial Sales Department, John Bean Division, Food Machinery and Chemical Corporation.

Check 6030 opposite last page.

Progressing-cavity pumps can handle suspended particles to 1-⅛" in diam. They are available in nine sizes in capacities of 1/100 to 500 gpm for pressures to 1000 psi. See full story in Bul 100-CP—Robbins & Myers, Inc.

Check 6031 opposite last page.

Non-priming centrifugal pumps are treated in 16-page bulletin, containing three pages of capacity-hp curves. Bul Q-1—The LaBour Company, Inc.

Check 6032 opposite last page.

Pump drives, base plates, couplings and other accessories for manufacturer's line of pumps are taken up in a bulletin covering direct-connected electric-motor, air-motor, pulley-and-sprocket, variable-speed-belt, hydraulic, and mechanical drives. Bul PD-760—Eco Engineering Company.

Check 6033 opposite last page.

Triplex power ends for reciprocating pumps are expanded upon in four-page bulletin including table of specifications. Bul L-1168—Industrial Department, John Bean Division, Food Machinery and Chemical Corporation.

Check 6034 opposite last page.

Drum pump which dispenses eight oz with each stroke and pail pump for use with five- and six-gal pails are topics of two catalog sheets also incorporating information on plastic faucets. Drum and pail pumps are taken up in Forms 406 and 409, respectively—Multi-Meter Corporation, Division of Rieke Metal Products Corporation.

Check 6035 opposite last page.

Pump cups are available in both conventional and 45°-bevel types in full range of sizes for all reciprocating pump and cylinder requirements. They are considered in Bul 5903—Darling Valve & Manufacturing Co.

Check 6036 opposite last page.

Totally enclosed hermetic pumps can be taken apart and re-assembled with open-end wrenches and a screw driver. Available in 13 sizes with one- to five-inch discharges, pumps are further specified in Advance Bul 977—Buffalo Pumps Division, Buffalo Forge Company.

Check 6037 opposite last page.

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CURRENT LITERATURE

Rotary, gear, centrifugal and portable pumps are depicted, respectively, in All-Chem and Minilab, Gearchem, Centri-chem, and Pumpmobile Buls—Eco Engineering Company.

Check 6038 opposite last page.

Pumps, of horizontal-shaft, vertical-shaft and vertical-cantilever-shaft designs are considered in four-page bulletin including installation photographs. Pumps Selector—Nagle Pumps, Inc.

Check 6039 opposite last page.

Helical-gear-driven pumps are available in capacities of 15 to 450 gpm and are delineated in Cat SP-534CC—Viking Pump Company.

Check 6040 opposite last page.

Conveying

Gravimetric feeders are available with max capacities of 500 to 300 tph. Additional information is contained in Condensed Cat—Syntron.

Check 6041 opposite last page.

Vibrating feeders can be designed into complete processing units. Available in 3 to 10′ lengths and in widths in 6 to 36″ range, they are reviewed in information published by Conveyor Division, Ajax Flexible Coupling Co. Inc.

Check 6042 opposite last page.

Vibratory feeders are available in models for handling wide range of products. They are tabulated in Hi-Vi Feeders Cat—Eriez Manufacturing Company.

Check 6043 opposite last page.

Checkweigher has accuracy to within ± 0.1%, with rate of speed at twenty 50-lb bags/min. System is expanded upon in Bul 3376—The Exact Weight Scale Co.

Check 6044 opposite last page.

Air-conveying systems for bulk handling are subject of facts published by Fluidizer Division, Daffin Corporation.

Check 6045 opposite last page.

Control panels permit automatic remote one-man control of multiple bulk-material and pneumatic-conveying systems. See full story in Bul G-9—Fuller Company, Subsidiary of General American Transportation Corporation.

Check 6046 opposite last page.

Pneumatic-conveying systems are covered in Pneumatic Conveying Fact Kit—Kennedy Van Saun Manufacturing & Engineering Corporation.

Check 6047 opposite last page.



U.S. Gypsum installs 24 Sweco separators in 16 plants

United States Gypsum Company's experience with SWECO Vibro-Energy* Separator performance ranges over 10 years and a variety of demanding applications. As a result of proved efficiency, economy and versatility, another SWECO unit was selected for installation at its recently completed, modern New Orleans quicklime facility. Also, the "turnkey" contract for design, engineering and construction was awarded to Southwestern Engineering Company.

This single-deck, 48″ diameter SWECO unit is equipped with a ⅜″ clear-opening screen cloth for processing calcined clam shells. Material runs from fines to 2″ pieces, at 100-150°F and 58-60 lbs. per cu. ft. High capacity throughput with no screen blinding yields low operating and maintenance costs. Simplicity of design and lack of transmitted vibration required minimum space and structural support. For full details, application data, or free screening demonstration in *your* plant with *your* materials, write SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Avenue, Los Angeles 58, Calif. Department 33-3.

SWECO

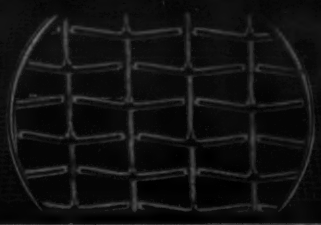
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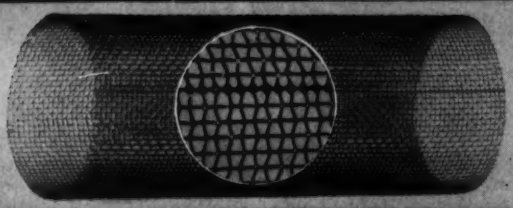
Check 6048 opposite last page.

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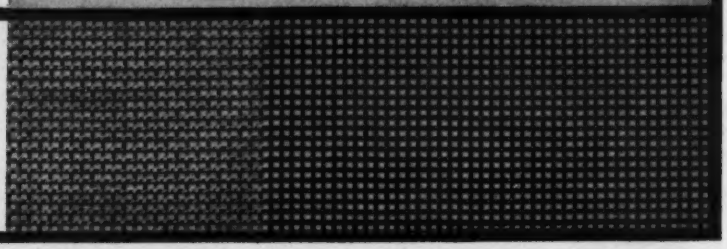


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Check 6049 opposite last page.

CURRENT LITERATURE

Conveyors of all types are covered in 48-page catalog including specific sections on completely automatic elevator for handling small parts magnetically and a totally enclosed bulk-material-handling conveyor featuring a two-directional chain to convey in any direction. Cat 700—Prab Conveyors, Inc.

Check 6050 opposite last page.

Pneumatic vibrators and associated equipment are topic of Cat 61 including details on various items in line—The Branford Company, Division of Electro-Mechanics, Inc.

Check 6051 opposite last page.

Moving and cooling and/or drying materials is job of vibrating equipment manufactured by Carrier Division, Chain Belt Co.

Check 6052 opposite last page.

Material Handling and Packaging

Tractor-shovels are available in models for up to 12,000 lb operating capacity. They are reviewed in Payloader Data—The Frank G. Hough Company, Subsidiary of International Harvester Company.

Check 6053 opposite last page.

Pouring spout for 28-mm plastic and glass containers is delineated on single-page information sheet also covering plastic faucets, five-gal-pail rack and pump and drum pump. Form 410—Multi-Meter Corporation, Division of Rieke Metal Products Corporation.

Check 6054 opposite last page.

Printweigher unit prints on full 8½ x 11″ forms, or on tickets or strips. Also, weight data may be transmitted electrically to remote adding or other office machines. Operation details are included in Bul 2017—Toledo Scale, Division of Toledo Scale Corporation.

Check 6055 opposite last page.

Bulk-handling railroad car is built with three separate compartments, each with its own nozzles and hatches. Details are available from Airslide and Dry-Flo Car Division, General American Transportation Corporation.

Check 6056 opposite last page.

Lift-truck line incorporates interchangeable power unit which has two driving wheels instead of one —Lift Trucks, Inc.

Check 6057 opposite last page.

Portable fuel-oil tanks are available for temperatures as low as −90°F. Each has own pump and gas engine. Cat Section 12—Dempster Brothers, Inc.

Check 6058 opposite last page.

Warehouse scales are available for installation in a pit or suspended from the floor in 20 different models for capacities to 10 tons. Further information may be obtained from Scale Division, Fairbanks Morse, a Major Industrial Component of Fairbanks Whitney.

Check 6059 opposite last page.

Safety

Protective-breathing-equipment line includes demand respirators, masks and sling-pack-cylinder outfits for safe entrance into hazardous atmospheres for 15 minutes of hard work. The Scott Aviation Corporation.

Check 6060 opposite last page.

Fighting fires with high-pressure water fog is discussed in 16-page bulletin. Principles of high-pressure-fog fire fighting, which cools, smothers and isolates the blaze, are reviewed along with presentation of various types of equipment to do the job . . . from small stationary units to full-size fire trucks. Bul L-1433—Industrial Sales Department, John Bean Division, Food Machinery and Chemical Corporation.

Check 6061 opposite last page.

Safety clothing is available in types for protection against fuming nitric acid, hydrogen peroxide, and other similar materials . . . and for protection against such materials as liquid oxygen. North PVC Safety Clothing—Dept. N, Jomac Inc.

Check 6062 opposite last page.

Plant Engineering

Tube-maintenance tools, including expanders, cleaners, and cutters are designed to improve operating efficiency of heat-transfer equipment. Tube-maintenance Equipment—Airetool Manufacturing Company.

Check 6063 opposite last page.

Aluminum grating is made with swaging and forming process to prevent cross bars from turning, twisting and coming loose. Grating is tabulated in Bul A759—Dept. I-16, Grating Division, Rockwell-Standard Corporation.

Check 6064 opposite last page.

Tilt-type container has six-cu-yd capacity and was specially built to store and handle a high-temperature dusty product. When full, it is picked-up, hauled and emptied by special truck designed to handle it. Details are contained in brochure, "Special Containers"—Dempster Brothers, Inc.

Check 6065 opposite last page.



ASK PHILADELPHIA!

Adding or removing heat in a process mixing operation is tricky. Improper baffling in any mix may permit swirling and drastically reduce the efficiency of coil type heat transfer surfaces.

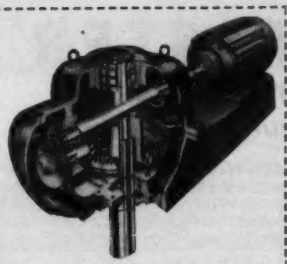
With viscous liquids, particular care is needed. Because stagnant zones must be avoided, baffling may have to be reduced or eliminated . . . and impeller size and speed must be chosen carefully to minimize swirling.

Want help with a critical process? Try Philadelphia. Philadelphia's engineering staff has dealt with hundreds of unique applications—can find new answers *fast* through skilled pilot process research.

Good General Rule: In promoting heat transfer, determine the flow pattern that will give the best transfer conditions—then get the mixer that provides it.

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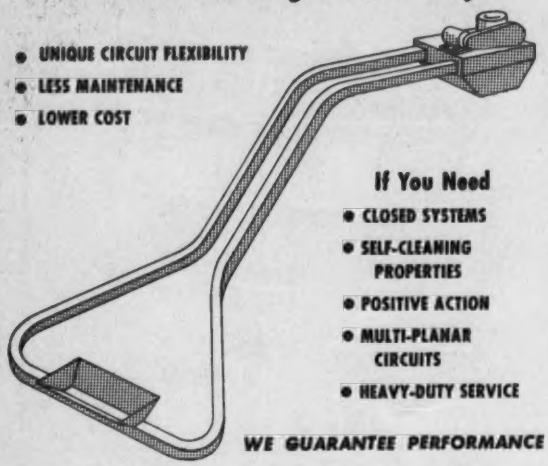
AGMA MEMBER

Check 6066 opposite last page.

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Check 6068 opposite last page.

CURRENT LITERATURE

Push of button gives motor protection, both starting and running, and fully automatic synchronization with high-voltage starters specified in Bul 8210—EC&M Division, Square D Company.

Check 6069 opposite last page.

Lubricating systems are discussed in catalog published by Manzel, A Unit of Houdaille Industries, Inc.

Check 6070 opposite last page.

Re-screening used rings costs less than buying new ones. Complete information on this service is available from Multi-Metal Wire Cloth Co., Inc.

Check 6071 opposite last page.

Vacuum pumps are available in capacities of 4.3 to 250 cfm, medium to high vacuum (to 20 microns of barometer). More data on these pumps are included in "Vacuum Pumps and Compressors"—Lammert & Mann Co., Inc.

Check 6072 opposite last page.

Pail rack which balances five-gal pail to ease pouring is presented on single-page data sheet also covering plastic faucets, pail pump and drum pump. Form 403—Multi-Meter Corporation, Division of Rieke Metal Products Corporation.

Check 6073 opposite last page.

Lubricating oil for natural-gas engines is introduced in 12-page bulletin, including service comparison photographs and table of physical characteristics. Estor G Bul—Humble Oil and Refining Company.

Check 6074 opposite last page.

Drives and couplings which incorporate "fluid" of heat-treated steel shot are indexed in 20-page bulletin including two pages of photographs and descriptions of practical problems solved. Bul 70—Dodge Manufacturing Corporation.

Check 6075 opposite last page.

Vinyl conduit has obtained UL-approval for underground service. Material won't support combustion and is non-sparking. More facts may be obtained from Dept. NJ-2, B.F. Goodrich Chemical Company, Division of The B.F. Goodrich Company.

Check 6076 opposite last page.

Pressure fans are reviewed in 20-page catalog incorporating capacity tables and constant-speed performance curves for direct-connected 3480-rpm set-ups and V-belt-drive capacity tables, in addition to other data. Cat 857—Clarage Fan Company.

Check 6077 opposite last page.



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Check 6078 opposite last page.

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Maisch Metering Pumps are simple in design and ruggedly built for long service. They are widely used for handling chemicals, syrups, oils, glue, processing solutions, etc. They can dispense boiling hot, ice cold, watery, or highly viscous liquids with equal efficiency. Available in wide range of capacities from 0 to 217 GPH. Materials: Biological and Industrial Pumps—Stainless Steel; Sanitary Pumps—Stainless Steel, or Plastic.

Immediately available.

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Check 6079 opposite last page.

Waste-container truck was produced to handle scrap-metal storage containers in capacities to 15 cu yd. It is covered in Cat Brief 160—Dempster Brothers, Incorporated.

Check 6080 opposite last page.

Horizontal steam turbines available in one- to 250-hp models are specified in Cat 200—Coppus Engineering Corporation.

Check 6081 opposite last page.

Wire-cloth specialties, such as brazed, seamless and Teflon-coated types are among those outlined in 120-page Wire Cloth Cat—Dept F, The Cambridge Wire Cloth Co.

Check 6082 opposite last page.

Obtaining dependable DC source is topic considered in Rectifier Equipment Guide—The Meaker Company, Subsidiary of Sel-Rex Corporation.

Check 6083 opposite last page.

Horizontal single-stage compressors are treated in six-page bulletin in which design features are described and pinpointed by means of numbered drawings. Bul 351—Pennsylvania Pump and Compressor Company.

Check 6084 opposite last page.

Steam cleaners and accessories are treated in eight-page bulletin giving application lists and in-use photographs, Bul L-1610—Industrial Sales Department, John Bean Division, Food Machinery and Chemical Corporation.

Check 6085 opposite last page.

Wire cloth can be woven from variety of metals, including platinum, gold, molybdenum, silver, tantalum, titanium and tungsten. Wire Cloth—Newark Wire Cloth Company.

Check 6086 opposite last page.

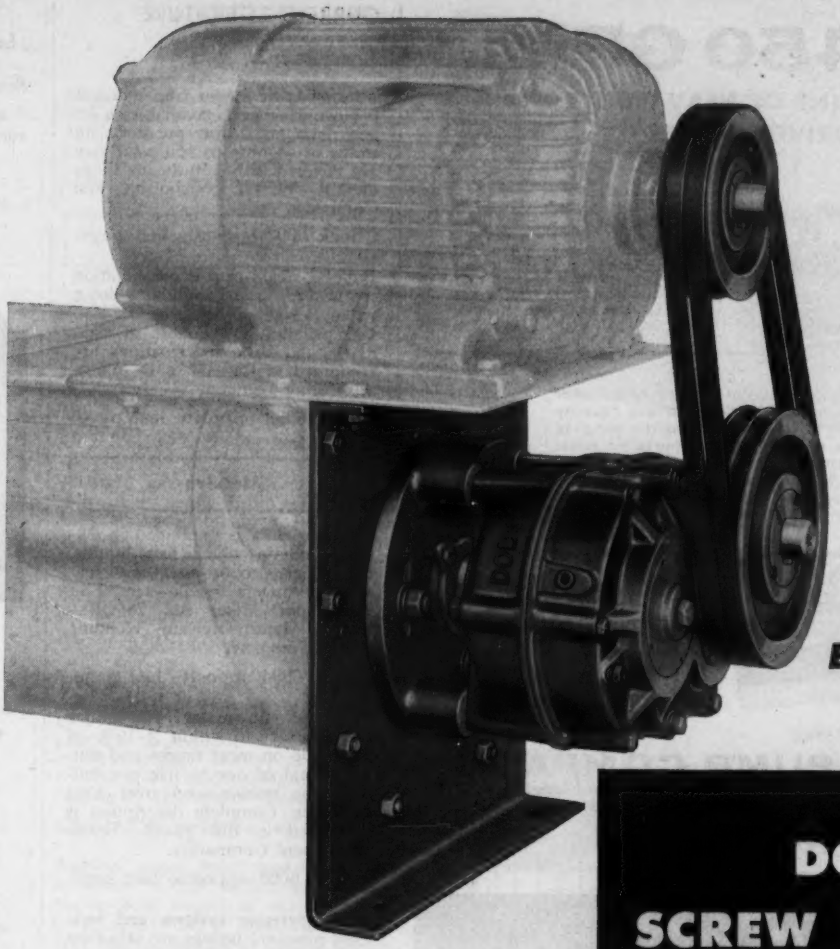
Steam Traps

Steam traps and temperature controls are covered by 166-page catalog containing sections on traps, radiator valves and balancing fittings, air vents, controllers, thermometers, pipeline strainers, pumps, radiation, and heat exchangers. Table of contents, product index and bulletin index make catalog easy to use. Steam Trap Cat—Sarco Company Inc.

Check 6087 opposite last page.

Steam-traps selection, installation and maintenance are taken up in 48-page Steam Trap Book—Armstrong Machine Works.

Check 6088 opposite last page.



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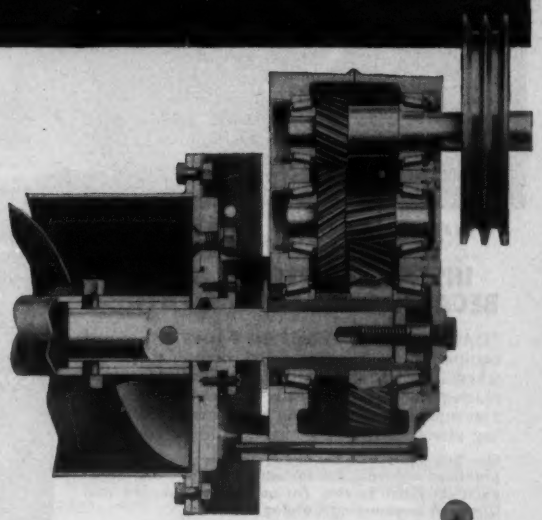
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- **Quick-removable Driving Shaft.**
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- **Trough End (optional).**

Amazing new ease of installation—new ease of maintenance—new economy! No external thrust bearing or motor base is necessary. (However, a motor base of special design is available as optional equipment.) Pre-selected Taper-Lock V-Belt drives give required speeds. Built-in puller makes it easy to change driving shaft—without opening reducer. External packing gland protects reducer. Helical steel gears. Timken Bearing equipped throughout. Available from stock with 1½", 2", 2⅞", 3" and 3⅞" driving shafts. Ask your Dodge Distributor, or write us for bulletin giving complete technical data.

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Check 6089 opposite last page.

NOW 15 to 450 GPM!

VIKING'S ENLARGED LINE OF HEAVY DUTY HELICAL GEAR DRIVEN PUMPS



Figs. 288 and 388 units with size "C" reducers, capable of handling up to 25 H.P. at 350 pump R.P.M.; 40 H.P. at 520 pump R.P.M. 20 to 450 G.P.M. capacities. Five gear ratios available, using one gear case. Six pump sizes in this series.

You now have an even larger range of Viking's helical gear driven units to fit your pumping jobs. Speed and capacity now range from 15 to 450 G.P.M. They're ideal for handling both thin and thick liquids, ranging from gasoline to molasses. Pumps equipped with packing or mechanical seals. Gear reducers independently mounted. All components can be quickly changed. Step up your delivery with these quiet, positive discharge, self-priming pumps!

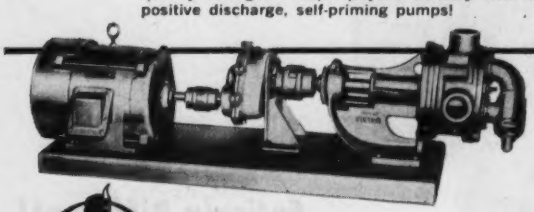


Fig. 288 units with size "B" reducers, capable of handling up to 10 H.P. at 1750 R.P.M. motor speed. 15 to 225 G.P.M. capacities. Six sets of gearing using one gear case. Six pump sizes in this series.

50 YEARS

Send today for catalog SP-534CC

VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, It's "Roto-King" Pumps
See Our Unit In Chemical Engineering Catalog

Check 6090 opposite last page.



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"DAVENPORT" Engineers have designed equipment to be dismantled before shipment, taken into building through limited space, and reassemble in place ready for operation. This Davenport innovation can save you costly building alterations, or expensive building additions.

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ROTARY DRYERS
Steam Tube, Hot Air and Direct Fire

Atmospheric DRUM DRYERS

ROTARY COOLERS
Water and Air

DAVENPORT MACHINE AND Foundry Company
A DIVISION OF MIDDLE STATES CORPORATION
Davenport, Iowa, U.S.A.

Check 6091 opposite last page.

CURRENT LITERATURE

Thermostastic steam trap has just one working part. Available in ½ and ¾" sizes for pressures in range of vacuum to 150 psig, they are covered in N-150 Steam Traps Details—W. H. Nicholson and Company.

Check 6092 opposite last page.

Impulse steam trap is combination steam trap, strainer and blow-down valve, is good for pressures of 8 to 600 psi and is available in sizes of ⅜ and ½". Specifications are contained in Bul T-1743B—Yarnall-Waring Company.

Check 6093 opposite last page.

Meters

Metering data is contained in 28-page bulletin which lists liquids, helps pick proper sizes and features of meters for flows of 2 to 2000 gpm. Meter Bul 566QP—Liquid Meter Division, Neptune Meter Company.

Check 6094 opposite last page.

Magnetic flowmeter transmitter has accuracy to within ± ½% of full scale on most ranges and output signal of one to five ma suitable for transmission over long distances. Complete description is contained in Bul 98418—Taylor Instrument Companies.

Check 6095 opposite last page.

Batch-metering systems and jacketed pipe and fittings are taken-up, respectively, in Buls FL-56 and J-56—Hetherington & Berner Inc., Subsidiary of American Hoist & Derrick Company.

Check 6096 opposite last page.

Liquid meters once pre-set remember quantities and automatically shut-off after each operation. Optional accessories include ticket printers for inventory and cost analysis, impulse contactors for remote registration, and controls to shut-off pump after delivery. Liquids Meters—Rockwell Manufacturing Company.

Check 6097 opposite last page.

Mixing and Blending

Rotary blenders start four-way blending while charging and continue it during discharge to produce intimate blends of dry and semi-dry materials within three to five minutes of start of charging. For additional information see Bul 080B—Sturtevant Mill Co.

Check 6098 opposite last page.

Mixers which are designed to handle any type of chemical materials are presented in Mixers Literature —Rapids Machinery Company.

Check 6099 opposite last page.

here's real ECONOMY...
time-saving SIMPLICITY...
and sure-fire DEPENDABILITY
for metering, measuring, controlling any piped material!



this Catawissa Cup-Orifice Plate CONVERTS any standard Catawissa Union into a GASKETLESS ORIFICE UNION



ELIMINATES the necessity of expensive gaskets... the uncertainty of what type gaskets are needed for specific temperature and pressure requirements... fumbling with extra parts!!!

Orifice Union problems of the past are gone forever! Stainless or carbon steel cup-orifice plate fits easily, quickly, securely to form a good, tight, leakproof seal. Temperature and pressure requirements are restricted only by the rating of the union itself (3000-lb. service, 9000-lb. test)!

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Check 6100 opposite last page.



You can *see* what's happening inside PYREX glass pipe. A quick survey along the line tells all—inside and out. No master detectives, no bloodhounds, nobody with x-ray eyes needed in a pinch.

Fact is, what you'd see if *you* were using PYREX glass pipe would be trouble-free operation. Dangerous *hidden* problems that corrosive chemicals produce in metallic piping are altogether eliminated.

That's because PYREX pipe delivers most fluids without a trace of corrosion. Problems of side reaction, pick-up, and contamination just don't develop — even at high temperatures. Clogging and caking are old hat, too—thanks to the slick, smooth surface of glass.

PYREX pipe actually costs less than most other corrosion-resisting materials when all installation costs are considered—much less when you include maintenance.

For the complete PYREX pipe story, write for a copy of Bulletin PE-3. Address: Plant Equipment Department, 2909 Crystal Street, Corning, New York.

CORNING GLASS WORKS
CORNING MEANS RESEARCH IN GLASS

Check 6101 opposite last page.

Mixers are a topic of discussion in 64-page Cat A-19—Philadelphia Mixer, Division of Philadelphia Gear Corporation.

Check 6102 opposite last page.

Gages

Gages have 2½" dials and are available in ranges to 1000 psi, in addition to 30" vacuum. They are further detailed in Service Gage Bul—Dept. C., Marsh Instrument Company, Division of Colorado Oil & Gas Corporation.

Check 6103 opposite last page.

Helicoid gages incorporate Bourdon tubes made from seamless tube and available in alloy steel, K Monel, stainless steel and phosphor bronze. Gages are further explained in Cat DH-65—Helicoid Gage Division, American Chain & Cable Company, Inc.

Check 6104 opposite last page.

A tank-gaging system incorporates a combination of a servomanometer with the purged-bubbler principle to preclude error caused by temperature change and absorbed gases. Tank-gaging Systems —Exactel Instrument Company.

Check 6105 opposite last page.

Nuclear gages have repeatability to within ± 2% of full scale or better, with ranges as narrow as 0.025 sgu (4°Be, 5° Tw, 10°API, 5% solids) available. They are delineated in Nuclear Gages Literature—The Ohmart Corporation.

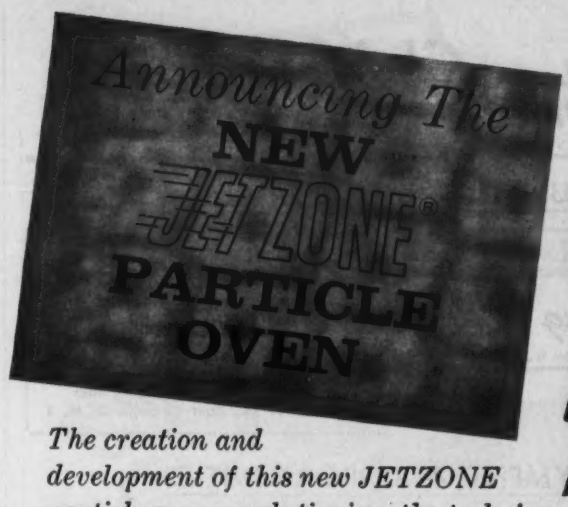
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Liquid-level gages are available for services from sub-zero to + 750°F temperatures. They are detailed in Cat 36—Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation.

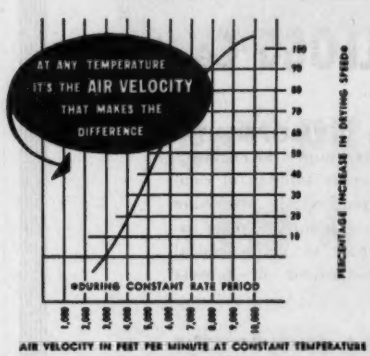
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This method embodies an air projection assembly which shoots high velocity air (hot, cool or dry) into the bed of material causing it to be completely aerated. All particles are in motion, but they are in regular contact with the conveyor in the fluidized state. This technique is a vast improvement over contemporary equipment and the JETZONE process reduces the treating times from 1/3 to 1/6 of conventional methods.

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3. Zoning is standard inasmuch as the ovens are by design sectional. On wet and/or delicate products full advantage can be taken of high temperatures in the initial zones.
4. A clean process — the material rests on a smooth stainless surface (no perforations or screens). Fines if present can be completely removed and collected. Because of special design, clean-up is in minutes for a change of products.
5. Equipment is compact. Where space is valuable a JETZONE unit will provide more production per cubic foot of plant.
6. Simplicity of design cuts manufacturing costs.

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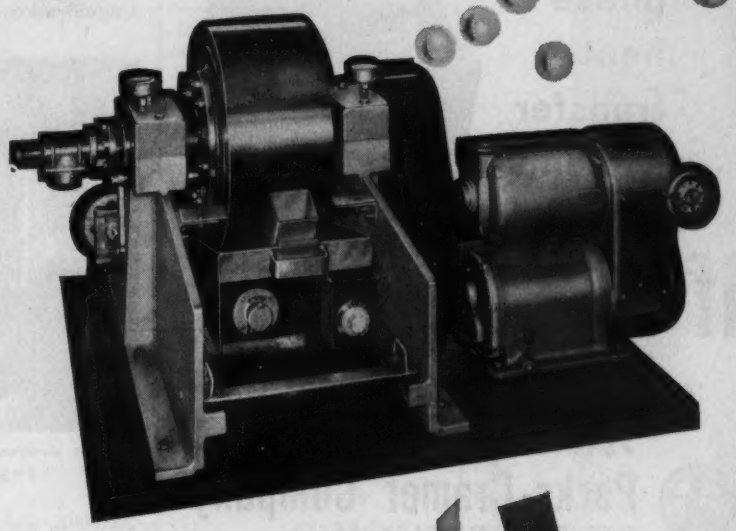
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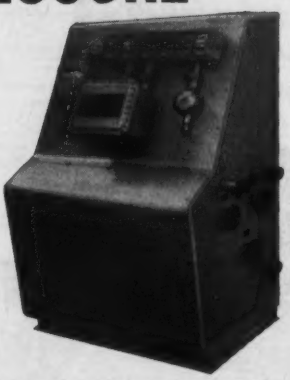


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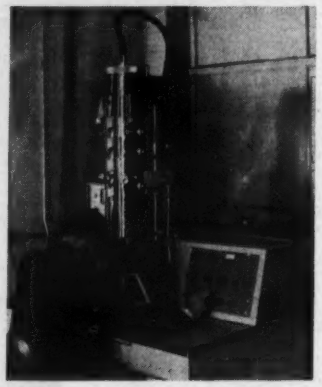
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☐ 5831	☐ 5874	☐ 5917	☐ 5960
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☐ 5844	☐ 5887	☐ 5930	☐ 5973
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☐ 5871*	☐ 5914	☐ 5957	☐ 6000
☐ 5872	☐ 5915	☐ 5958	☐ 6001

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☐ 6007	☐ 6036	☐ 6065	☐ 6094
☐ 6008	☐ 6037	☐ 6066	☐ 6095
☐ 6009	☐ 6038*	☐ 6067	☐ 6096*
☐ 6010*	☐ 6039	☐ 6068	☐ 6097
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☐ 6012	☐ 6041	☐ 6070	☐ 6099
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☐ 6027*	☐ 6056	☐ 6085	☐ 6114
☐ 6028	☐ 6057	☐ 6086	☐ 6115
☐ 6029	☐ 6058	☐ 6087	☐ 6116
☐ 6030	☐ 6059	☐ 6088	☐ 6117

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☐ 5558	☐ 5592*	☐ 5626	☐ 5660	☐ 5694*	☐ 5728	☐ 5762	☐ 5796
☐ 5559	☐ 5593*	☐ 5627	☐ 5661	☐ 5695	☐ 5729	☐ 5763	☐ 5797
☐ 5560	☐ 5594*	☐ 5628	☐ 5662	☐ 5696	☐ 5730	☐ 5764	☐ 5798
☐ 5561	☐ 5595	☐ 5629	☐ 5663	☐ 5697	☐ 5731	☐ 5765	☐ 5799
☐ 5562	☐ 5596	☐ 5630	☐ 5664	☐ 5698*	☐ 5732	☐ 5766*	☐ 5800
☐ 5563	☐ 5597	☐ 5631	☐ 5665	☐ 5699	☐ 5733	☐ 5767	☐ 5801
☐ 5564	☐ 5598	☐ 5632	☐ 5666	☐ 5700	☐ 5734	☐ 5768	☐ 5802*
☐ 5565*	☐ 5599	☐ 5633	☐ 5667	☐ 5701	☐ 5735	☐ 5769	☐ 5803
☐ 5566	☐ 5600	☐ 5634	☐ 5668	☐ 5702	☐ 5736	☐ 5770	☐ 5804
☐ 5567	☐ 5601	☐ 5635	☐ 5669	☐ 5703	☐ 5737	☐ 5771	☐ 5805*
☐ 5568	☐ 5602	☐ 5636	☐ 5670	☐ 5704	☐ 5738*	☐ 5772	☐ 5806
☐ 5569	☐ 5603*	☐ 5637	☐ 5671	☐ 5705	☐ 5739	☐ 5773	☐ 5807
☐ 5570	☐ 5604	☐ 5638	☐ 5672	☐ 5706	☐ 5740	☐ 5774	☐ 5808
☐ 5571	☐ 5605	☐ 5639	☐ 5673	☐ 5707	☐ 5741	☐ 5775	☐ 5809
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☐ 5584*	☐ 5618	☐ 5652	☐ 5686*	☐ 5720	☐ 5754	☐ 5788	☐ 5822
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☐ 5591	☐ 5625	☐ 5659	☐ 5693	☐ 5727	☐ 5761*	☐ 5795	☐ 5829

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THAT'S INTERESTING

Drug helps mentally ill

Intended to stimulate breathing and reverse the depressing effects of anesthesia and sedatives, vanillic diethylamide has been found to be a chemical substitute for shock therapy in treating the mentally ill.

The drug, a product of U.S. Vitamin & Pharmaceutical Corp., worked like electroshock but without the hazards of the latter.

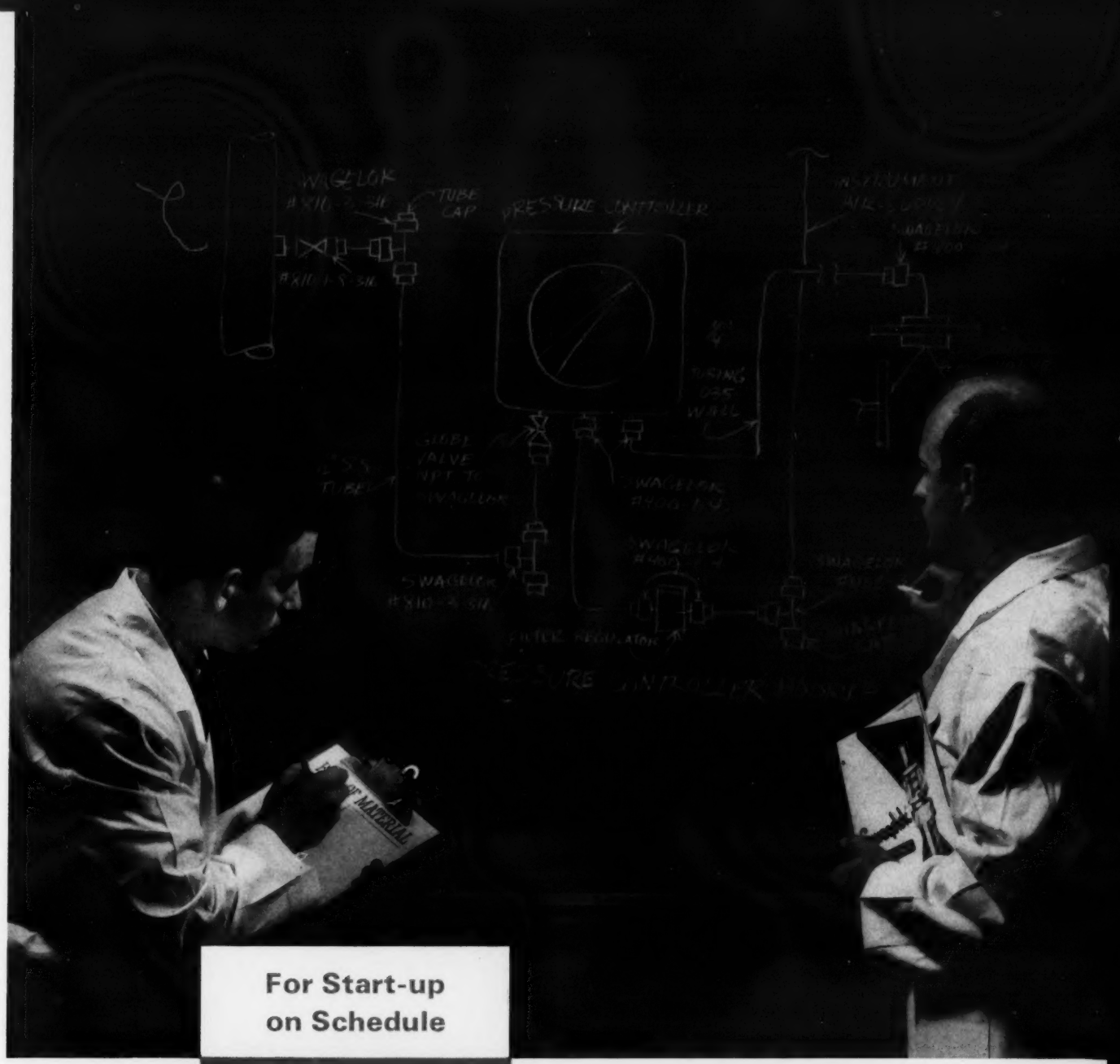
CO_2 draws mosquitoes

U.S. Department of Agriculture entomologists have discovered that carbon dioxide, the principal gas exhaled in breathing, serves as a homing beacon for mosquitoes.

The obvious solution is to quit breathing although this may not be practical in many cases.

An alternative is to use an insecticide.

For more information on product at right, specify 6114 see information request blank opposite last page.



For Start-up on Schedule



Don't Let Leaky Connections Cause Expensive Delay at Start-up

These engineers are specifying Swagelok for plant construction. The most severe test of tube fitting design and quality is in plant construction. Many plants have been built using 10,000 to 20,000 or more Swagelok tube connections without a leak. You can spend days to find one leak among the thousands of tube connections on a construction job.

Insure plant start-up on schedule—specify Swagelok

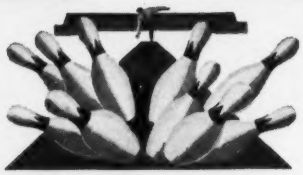
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U.S. VARIDYNE system synchronizes conveyors for point-to-point pin transfer



Problem: Brunswick's "Dura-King" pin required multiple dips in liquid plastic to achieve its high impact-resistant plastic coating. Resultant highly explosive atmospheres required *explosion-proof* production methods. In addition, accurate synchronization for point to point transfer between *five* variable speed, multimotor conveyors was required. **Solution:** U.S. VARIDYNE a/c Drive System with *Coordinated Start and Stop Control,* and U.S. Explosion-Proof A.C. Motors. Richards-Wilcox engineers, working with Brunswick Corp. engineers and U.S. MOTORS field engineers, chose VARIDYNE over a d.c. system because: initial start-up is simplified; instantly synchronous without warm-up; needs no synchronizing readjustments; there is no cumulative error; and *explosion-proof a.c. motors* can be used. VARIDYNE varies the frequency of a.c. current to these motors, converting them to adjustable speeds...automatically coordinated. *Write today for* VARIDYNE *Brochure F-1963.*

U.S. ELECTRICAL MOTORS INC.
P. O. Box 2058 • Los Angeles 54, California or Milford, Conn.

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